agriculture

Vol. 75 No. 6 June 1968

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Harper Adams
College Farm

page 262

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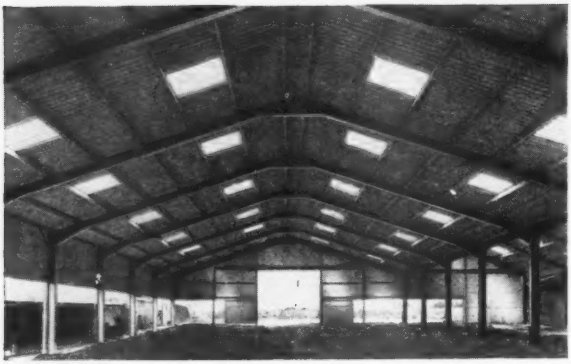

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The Fertili

John Walker, 36. Lives in Malvern. Senior ICI Rep, Worcs. London-born, got the farming bug as 1943 evacuee on 2 Hants. farms. Read Agriculture at Cambridge then farmed in Dorset for a year before joining ICI.

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60-hour weeks don't leave John much time for his quieter hobbies of gardening and salmon fishing, but he still manages to make his own flies.

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He's 39, lives in Devizes with wife and 2 children. Manages to fit in Round Table activities, fishing and 7-handicap golf.

Hugh Griffiths, ICI Development Officer for South Wilts., Dorset and Somerset. Grew up on parents' N. Wales mixed farm.

Read Agricultural Botany at University College, N. Wales. Joined ICI in '47 after stint at the NAAS and teaching at a Salops. Agricultural College.

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ty People.

lf Walsh N.D.A., N.D.D., Dip. Agriculture (Leeds). Father armed in West Riding. Alf joined he NAAS in 1945 (his two rothers are still there), and CI in 1950.

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Alf: "A lot of farmers don't ealise we can offer them a more rofitable business".

Jim Clark.
ICI's Chief Agricultural Economist. Born in Ayrshire, educated at West of Scotland Agricultural College.

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Agriculture

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Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London, S.W.1.

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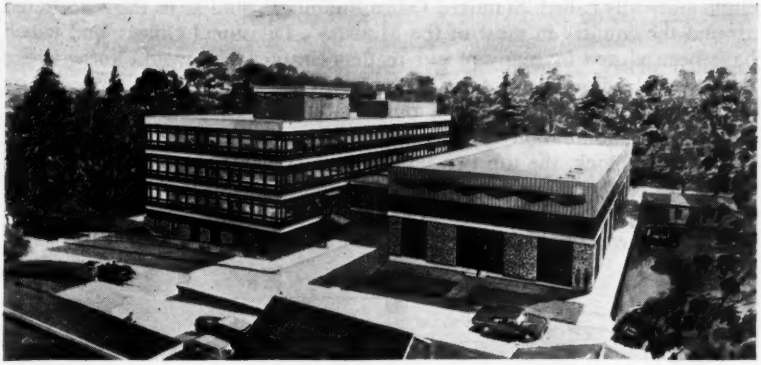


Computers at the Farmers' Service

D. Kimber

THE Ministry of Agriculture, Fisheries and Food has been a user of computers since early 1958 and since that date has carried out a continuous policy of concentrating various types of work on these machines. Appropriation Accounts and Data Processing Division is responsible within the Ministry for the operation of computers which are located in an office that is situated on the edge of Merrow Downs in Guildford, Surrey. At this moment the Ministry is receiving delivery of a large modern computer to replace the present equipment which in part is rapidly becoming obsolete. The new computer, manufactured by International Computers and Tabulators Limited, is called an I.C.T. 1907, and in due course will take over all work on the present machines and have sufficient capacity to carry out additional tasks.

At present, all payments emanating from the Ministry, whether they relate to the Fatstock Guarantee Scheme, Cereals Deficiency Payments Scheme, Fertilizer and Lime Subsidies or all other Production Grants, are prepared at Guildford. The information on the Agricultural Census Form is converted into punched cards and processed by the computers to produce the many statistical analyses relating to the Censuses. In addition a large volume of

work relating to the management of farm enterprises, National Food Survey, and a variety of other statistical jobs, together with all the Ministry's accounting arrangements, including payment of wages and salaries, are also handled by computer.

The computers so far have been housed in accommodation which is euphemistically called 'Standard Office Buildings', similar to those scattered around the country in most of the Ministry's Divisional Offices, and which have been visited by many of our readers (in fact they would know where the essential offices are as soon as they enter the front door!). Opportunity has now been taken to build a purpose-built computer hall with proper temperature and humidity-controlled conditions and at the same time a four-storey office block, the top two floors of which will house the young ladies who transfer the information from documents on to punched cards. The Ministry of Agriculture, Fisheries and Food with a new computer and new building will certainly look upon 1968 as a landmark.

Harper Adams College Farm

R. Kenney

HARPER ADAMS College lies two miles to the west of Newport in Shropshire and is situated in one of the best mixed farming areas in Britain. The soil type varies markedly from light bunter sandstone on the south side to heavy loam with some stiff clay pockets on the north. The total acreage of the estate is 367 acres including 12 acres occupied by the National Poultry Institute which is an integral unit of the College; 291 acres are fully available for cash crop and grass production with a 14-acre winter sports and athletics ground providing some summer grazing.

Any agricultural teaching centre must have three objectives in mind when planning the organization of its farm—teaching requirements, research investigation and sound commercial practice. The degree of emphasis put on each of these objectives can, and should, vary widely, particularly in relation to the amount and type of research work involved. At Harper Adams, we regard research as being of vital importance but the other two objectives must also receive careful consideration and to reconcile all three is not easy; it demands most careful planning to maintain the right balance.

In the past, cereals, potatoes and sugar beet, have been grown on the College farm and all forms of livestock production practised. The emphasis placed on individual crops and in particular on livestock products has varied markedly but pigs and poultry have always played a major part. However, in

recent years it has been decided to adopt a far greater degree of specialization; to cut out some enterprises and expand others. Thus a small flock of breeding ewes has been sold, as it proved quite uneconomic to maintain on land worth over £300 per acre and the same principle applies to extensive beef production. At the same time, the dairy herd is being increased from 50 to 80–85 cows and an intensively-housed beef unit is being built up as quickly as possible. The acreage of cereals and potatoes has been increased and sugar beet and grass reduced, although a really efficient drainage system, coupled with other improvements and intensification, could well lead to an increase in the present beet acreage.

Table 1

Cropping (acreage)

	1962–63	1965–66	1966–67	1967–68	1968–69 (*Provisional*)
Winter wheat	52	49	72	71½	76
Spring barley	34	68	47	45	35*
Winter oats	2	3	12	14½	10
Beans	—	1	1	12	12
Early potatoes	—	10	10	14	14
Main crop potatoes	23	26	28	28	28
Sugar beet	27	21	7	10	25*
Maize	18	1	—	—	—
Total crops	156	179	177	195	200
1–year ley	36	30	31½	22	20½
3–4 year ley	92	75	65½	29	25½
Long leys	18	18	26	54	54
Total grass	146	123	123	105	100

Notes 1. The total acreage has decreased by 2 as from 1966/67 due to the erection of new buildings.
2. *Sugar beet may be reduced and barley acreage increased.

Table 2

Stocking (4th June)

	1963	1965	1966	1967	1968 and 1969 (*Provisional*)
Dairy cows	53	59	58	65	80
Dairy replacements	53	61	68	67	65
Beef cattle	23*	38*	3*	17‡	100‡
Breeding ewes	75	100	95	—	—
Pigs—breeding stock	89*	100†	104†	120†	125‡
Pigs—fatteners	487	752	858	836	930
N.P.I. layers	4,213	8,417	8,851	9,232	9,500
N.P.I. other poultry	9,377	6,950	7,375	6,977	7,000
B.E.M.B. unit					
Layers	—	—	—	5,900	8,000
Growers	—	—	—	8,000	9,000

*Outdoor unit. †Part outdoor, part indoor unit. ‡Indoor unit.

At 31st December, 1967, the dairy herd had increased to 74 cows and the beef cattle to 68.

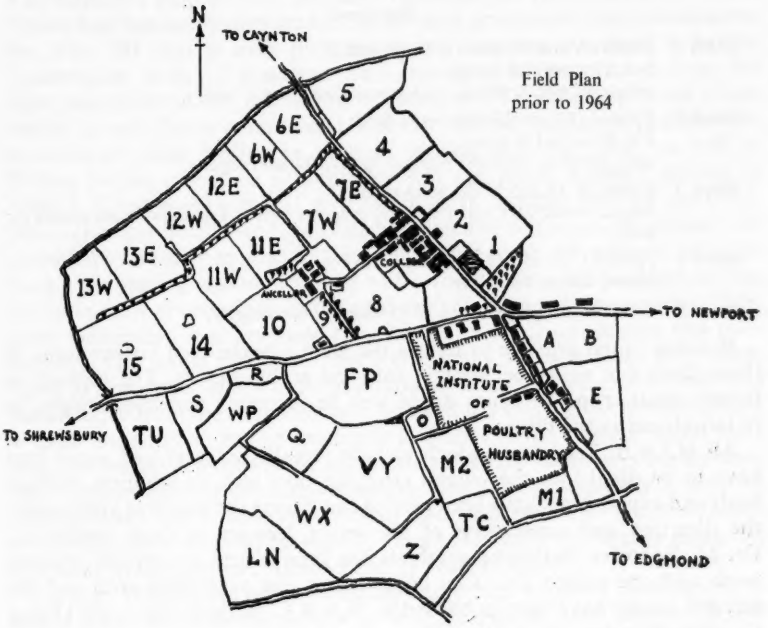
To bring about these changes in cropping and stocking and to develop 'economic units' with real teaching value, a plan of reorganization was started in the autumn of 1963. This basic plan was divided into three sections, namely: Field and Crop Plan, Building and Stock Plan and Grain and Feed Plan.

Field plan

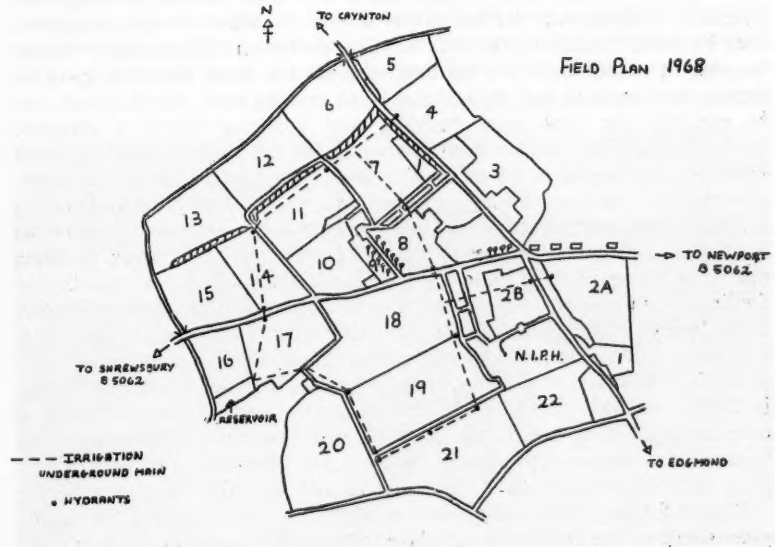
The Newport–Shrewsbury road (B 5062) bisects the farm; the soil on the south side of this is generally excellent for crop production and this has been developed as one large arable block. The only exception is Field 16 which has a different soil structure and lies very wet at its south end. In the autumn of 1963, approximately two miles of hedges and some trees were removed from this block, and approximately one mile of open ditches were piped and two pits were also drained and filled in. Various banks and old trackways were bulldozed out and new permanent roads constructed. In effect, seventeen separate areas, some as small as 4 acres became six larger blocks (Nos. 17–22) and cultivation work has been greatly simplified and speeded up through this operation. On the north side of the farm, minor alterations have been made to field divisions, again with the object of providing easier cultivations and a new permanent roadway system has also been constructed. It is now possible to get from the main buildings to any field very easily by a hard road. Ditches have been piped and about 4 acres of waste land (largely pits) reclaimed; for this we were fortunate in obtaining sufficient good soil, carted free of charge, when a major road scheme was carried out in the vicinity of the College. Apart from ditch piping, field drainage has been necessary over a large area; unfortunately, full completion of this plan has not been possible during the past winter due to foot and mouth precautions. However, the position today is a vast improvement on that of three years ago, and the whole catchment area now discharges into the main boundary brook at fifteen points. Some miles of new fencing has been erected by the farm staff and wherever possible, half sleeper anchor posts, high tensile wire with end strainers, and wooden droppers, have been used. This type of fencing has created considerable interest amongst visiting parties for it is a sound long-term investment costing only 2*s.* 9*d.* per yard for materials and labour and it provides a completely trouble-free stockproof fence for many years. Wooden gates have been largely replaced by metal ones, and greater width provided; today the dairy herd can be moved on good roadways to any grazing field by one man.

High yields of cash crops and grass demand good well-drained land and efficient production techniques. It was appreciated that good yields could be achieved on the College farm in most seasons but lack of moisture, particularly with potatoes and grass, and to a lesser extent with beet at certain stages of growth, was a limiting factor. Accordingly, irrigation was carefully considered to determine both its feasibility and economic value and it was decided to draw up a complete scheme. Fortunately, an ideal site existed at the south end of Field 16 for building an unlined surface reservoir which could be supplied very simply from the boundary brook. An underground ring main with two subsidiary offshoots was laid and irrigation can now be carried out on any part of the farm. Without question, irrigation has enabled us to intensify both cropping and stocking and its value was very apparent during the summer of 1967.

Although the main arable block has been cleared of unnecessary hedges, both shelter-belts and hedges have been retained on the grazing areas; in fact, far more young trees have been replanted than have been removed, and some new hedges have also been planted. The aim is to provide permanent grazing areas for the dairy herd as close as possible to the buildings. This is



Field Plan
prior to 1964



shown in both the field plans on p. 265 and in the rotational details on p. 266.

Rotations

Block 1 Fields 2A and 10, 4 and 6, 18, 19 and 20
5 × 25 acres (125 acres)
potatoes, wheat, wheat, barley/beans/sugar beet, barley.

Block 2 Fields 1, 21 and 22 (light sand land)
3 × 14 acres (42 acres)
early potatoes (Italian ryegrass) barley, Italian ryegrass.

Block 3 Fields 14, 15 and 17 (37 acres total)
wheat, winter oats, short rotation ryegrass with 3–4 acres potatoes mainly for seed.

Block 4 Fields 11, 12 and 13 (42 acres total)
wheat, wheat, 4-year ley.

Block 5 Fields 2B, 3, 5, 7, 8, 9 and 16. (54 acres total) long ley.

If it was found possible to reduce the grass acreage even further some of these fields can easily be brought into the arable blocks. The acreage of forage cereal crops, or beans might well be increased and maize might be re-introduced in the future.

All N.I.A.B. Trial Plots which include cereals, potatoes and sugar beet have to be fitted into the overall cropping plan and, in addition, various trials and experiments have been carried out during the past five years under the direction and supervision of the senior lecturer in crop husbandry, Dr. M. Eddowes. Particular emphasis has been placed on applied research work with the potato and, to a lesser extent, the sugar beet crop and the detailed results have been published in H.A.A.C. Bulletins Nos. 10, 11 and 12, obtainable direct from the College price 5*s.* each.

Building and stock plan

Cattle unit. The dairy herd in 1963 consisted of pure Friesians and Ayrshires and crosses between these breeds but it was then decided to keep only Friesians. Milking was carried out in both a double-row and a single-row shed by bucket machines, the milk being carried to an adjacent dairy. Winter housing of young stock was scattered and far too much time was spent on feeding and mucking out. By utilizing some existing yard and silo areas, and by erecting one new main building and adapting others, a complete 'umbrella' building area has been developed, for 250 head of cattle. This area includes a herring-bone 4/8 milking parlour, lying and collecting cow yards, covered silo, calf pens, loose boxes, bull pen, young stockyards and also an intensive beef unit. Storage of hay, straw and concentrates to serve the 'umbrella' area has been greatly simplified and slurry and muck handling markedly improved. Adjoining is a yard for 36 head which has press-button feeding arrangements from a tower silo. A number of trials, directed by Mr. R. G. Mortimer, have been carried out with feeding maize silage to beef cattle and more recently, grass and whole-crop cereal silage to a group of dairy cows. Preliminary results with oat silage are encouraging. Trials were started in April, 1967, with some Charolais × Friesian bull calves in the beef unit and comparisons will be made with our own pure Friesian steer calves. Unfortunately, foot-and-mouth disease has seriously hampered a project to test-mate some Charolais bulls in co-operation with the Milk Marketing Board.

Winter feeding of the dairy herd is at present based on self-fed, wilted grass silage to one group and oat silage to the other group; with 4 lb hay this

silage provides maintenance, plus 1 gallon. The next gallon is produced from 4 lb barly/beet pulp mixture and dairy cubes are fed above this level. Fresh-calvers and first calf heifers are fed rather more generously with concentrates but after 200 days in milk they receive less than the standard; a flexible 'steaming-up' policy is practised. Zero-grazing of Italian ryegrass from the light land arable blocks is now routine, both at the beginning and end of the winter period. This is considered extremely valuable in helping to adjust the cows from winter feeding to summer grazing and vice versa, as well as helping to save money on concentrates, hay and silage. Paddock grazing of fields 5, 7 and 8 (30 acres) is now the basis of summer feed for the cows, although either field 11 or 12 is available whenever necessary. Phosphate and potash are normally applied in the autumn and up to 400 units of nitrogen during the grazing season. Topping with a forage harvester has been carried out after each grazing but, as the need for this is now being questioned by some authorities, it is proposed to compare results from topping and non-topping. The whole aim is to produce virtually all milk from grass from April to September and also from a reduced acreage. Grass conservation is mainly done from the short-duration leys and the silage grass is wilted. Only a small tonnage of hay (barn-dried) is made. After a good initial start autumn- and winter-born heifer calves are reared on 'clean' leys during their first summer without any supplementary feed and subsequently mainly on cheaper bulky type foods. The Friesian stock bull runs with the main batch of bulling heifers from 1st November to mid December on foggage grass, the aim being to calve down between 2 and 2½ years of age.

Pig unit. The existing piggery buildings have been modified considerably in recent years; six fattening houses to hold 80 pigs in each, additional sow houses and an experimental house have been added. Originally, all the breeding stock was kept outdoors on the very light land area, followed by a three-year period when half were outdoors and half indoors. Although the results were slightly better from the outdoor group, the overall problems of management, particularly labour organization and feeding in hard weather conditions, far outweighed this difference and all stock are now kept within the main unit. Approximately half the sows are pure Large Whites and half are crossbreds; the boars are either Large White or Landrace.

New yard and parlour on site of the old yard

The majority of the fattening pigs are sold for bacon to F.M.C. on contract; a small number go for pork.

The basic rations have not changed a great deal over the years, although some modifications are made from time to time according to ruling prices. Rations have in the past been mixed on the unit itself but these are now largely handled by the new centralized mixing plant. Two fattening houses are equipped with a pipeline feeding system. The other four are dry fed.

Slurry disposal is carried out for this and the other stock departments by a Manurain tanker.

Under the direction of Mr. J. R. Luscombe, the Pig Department has shown a handsome profit, and this has averaged £3,093 over the past three years. In addition, experimental work is being conducted, and the students on the post-diploma course in Pig Technology are carrying out individual project work with groups of animals. One of the most interesting experiments has been the use of field beans as a substitution for soya bean meal and early results have been very encouraging.

National Institute of Poultry Husbandry. This Department requires a separate article to do it any justice, for it is easily the largest Poultry Teaching Unit in Britain. Tremendous specialization has occurred within the poultry industry, but it is quite impossible to follow this pattern at N.I.P.H. to more than a limited extent. Students taking poultry courses now find it extremely difficult to gain practical experience in more than one or possibly two specialist fields and, therefore, gaps in this experience must be filled in during their training here. This can be provided for them because the type of buildings, the stock maintained and the management systems adopted, cover virtually every facet of the industry. Naturally, many improvements and modifications to housing and feeding methods have been introduced. A new environmentally-controlled rearing house for 6,000 birds has been built to replace outdoor systems, the marketing building has been enlarged and modernized, and the waterfowl section made a more intensive unit.

Adjoining N.I.P.H. is the British Egg Marketing Board Unit, the largest applied Poultry Research Unit in Britain. It was officially opened by the Rt. Hon. F. Peart (then Minister of Agriculture), in September, 1966, and will undoubtedly prove of real value to egg producers as well as providing excellent teaching facilities.

Other buildings. The old double-row cowshed has been converted to a main potato store and two buildings which served as a rabbitry have made excellent potato chitting houses; the old granary and some stock buildings have been absorbed into the new mill/mixing unit. A new farm workshop has been constructed at a far more convenient site, and the old one is now used for small group demonstrations.

Grain and feed plan

All grain is now handled in bulk, and in-bin drying and storage exists for 400 tons, which may increase to 600 tons. A centralized milling and mixing unit with cubing facilities has been fitted into the old granary and single-row cowshed, and all the stock units will be served from this unit. As far as possible mixed rations will be handled in bulk, although bagging-off facilities are available. Feed costs have always been a vital economic factor in the production of livestock products; today these costs have become even more important and this new unit should quickly prove its value.

Economics

This overall plan has obviously meant heavy capital expenditure but is considered a wise investment. If we had spread the expenditure over a much longer period, it would have cost more and we would have failed to achieve the many advantages, financial and otherwise, already accruing. Technological advances in agriculture are taking place so rapidly that it would be foolish to assume no further capital developments will be necessary over the next five years but these should be limited.

All capital expenditure has been treated as a landlord's charge; after deduction of the appropriate grant which a private landlord would have received, an annual rent charge of 8 per cent is made in the Trading Account. The Pig Department has been a highly successful economic unit for many years, and in spite of the handicap of many small sections, the Poultry Department pays its way. The Farm and Cattle Unit also made a profit in 1966–67 in spite of a marked increase in the rent charge.

The Gross Margins in 1966–67 for the main farm enterprises were as follows:

Dairy herd	£95 per cow (60 cows)
Cereals	£36 per acre (119 acres)
Sugar beet	£44 per acre (14 acres)
Early potatoes	£135 per acre (11½ acres)
Maincrop potatoes	£150 per acre (26½ acres)

This article has been contributed by **R. Kenney, B.Sc., N.D.D.**, who is Principal of Harper Adams Agricultural College which incorporates the National Institute of Poultry Husbandry.

Weed Control Conference

THE ninth British Weed Control Conference will be held under the auspices of the British Crop Protection Council from 18th to 21st November, 1968 at the Hotel Metropole, Brighton, Sussex.

The Conference will be residential and all interested in the scientific and technical aspects of the subject are invited to attend.

Further details may be obtained from the Conference Secretary, Mr. W. F. P. Bishop, 140 Bensham Lane, Thornton Heath, Surrey CR4 7YU, England. Telephone THOrnton Heath 2973 (01-684 2973). Telegrams: Agritract Croydon.

Mr. F. J. P. Obery, General Manager of the Agricultural Mortgage Corporation, discusses the traditional sources from which capital is provided for the industry

Finance in Agriculture

IN 1965 the Government announced a programme of selective expansion for agriculture up to 1970. It is impossible to forecast precisely the additional investment needed to fulfil this programme, because capital requirements will depend on the rate of expansion in output and of release of labour, and on individual farmers' decisions about the most economic method of increasing efficiency. The Farmers' Unions estimated that to achieve the technically possible increases in output, fixed gross investment in agriculture at 1963 prices would need to rise between 1963 and 1970 from £169 million to £200 million per year, for additional buildings, vehicles, plant and machinery. Further working capital would also be needed to finance the expansion of livestock and such material requisites as fertilizers and feedingstuffs.

What are the sources?

The traditional sources from which capital has been provided for the industry have been *patrimony*, *matrimony* and *parsimony*. During the last twenty years the State has become increasingly important in providing finance in the form of a variety of grants and subsidies. Family resources, *patrimony* and *matrimony*, whether in the form of gifts or loans, are still an important source to many individuals although this can represent a transfer within the industry. *Parsimony*, that is retained profits after payment of income tax and surtax, affords a diminishing supply to many individual farmers but for the industry as a whole, net income has been increasing. This should in the future still provide the largest part of any increase in investment within the industry. Indeed the Government recognizes that farm income is the main source of finance for any further investment that may be necessary and is using the machinery of the Annual Price Review for this purpose as it has done in the past. In calculating aggregate net income an allowance is made

for investment in plant and machinery and sundries by charging depreciation provisions of about £100 million. Some landlord-type investment is financed from rents, which are charged when calculating net income, and in additiom finance is provided by such grant schemes as the Farm Improvement Scheme.

Over recent years, land values have risen due to a combination of factors not least of which is an increased demand due to the desire to 'hedge' against inflation. When estate duty and other taxes on capital become payable, the amount levied may well have to be raised by borrowing as the only alternative to the sale of land. To the extent that such 'fragmentation by taxation' resulted in small or less efficient farming units, it would militate against the provisions of the Agriculture Act 1967, which are designed to improve the structure of farms by amalgamating uncommercial holdings into viable units. The availability of sources of borrowed funds is important if this undesirable fragmentation is to be avoided. In the past, small areas of land have been sold for building purposes to provide finance for capital improvements to raise the productivity of the holding. The new Development Levy will reduce the advantage of turning into cash in this way the paper increase in the capital tied up in the land.

If the agricultural sciences are unable to maintain their past rate of output of methods of improving the productivity of existing resources, there will be an increase in the demands made on existing sources of capital if the selective expansion programme is to be achieved.

Features of agricultural borrowing

If adequate finance cannot be obtained from one's own or family sources, it must be borrowed from outside the industry. A farmer or landowner may be willing or may have to accept a low or nil return on his personal investment. He must, however, pay interest for the use of borrowed money and that money must of course be paid back. It is essential, therefore, for both the borrower and the lender to make certain that credit is provided on such terms that it can be used in the business profitably. The total supply of capital available for national use is not unlimited and depends basically on the prosperity of the country. If adequate profits are not earned, there will be insufficient savings or cash for investment to meet the increasing demand for new capital. Although agriculture is in competition with other industries for capital and cannot offer as remunerative an investment as some of those industries, it can offer one of the safest forms of security. Perhaps this is why there is no shortage of credit for a farmer who is credit-worthy and efficient.

Generally speaking, the agricultural industry operates in small production units. This precludes the access to the supply of permanent capital available to the industrialist whose activities are on a scale and achieve a degree of profitability which justify the formation of a Joint Stock Company.

Matching borrowing to need

When the capital required has to be borrowed, it is of the utmost importance to ensure that the type of loan matches the purpose for which finance is required. Floating capital for the purchase of implements, feedingstuffs and fertilizers may best be obtained from the banks who are the appropriate and cheapest lenders of this type of credit. Recent credit squeezes have, however, highlighted the risks of using bank credit, which is essentially short

term, to meet a long-term need such as land purchase or the provision of new buildings and other fixed equipment.

Private loans are no more appropriate than bank loans when long-term credit is needed. The lender may die or he may require his money back for his own use. The private lender has the right to call in his loan by giving three months' notice. Quite apart from the legal and other expenses which the borrower incurs in obtaining a new loan, he runs the risk, when using short-term credit to meet a long-term need, of being unable to meet a demand for repayment by borrowing from another source. This could happen during a credit squeeze. At such a time interest rates are usually high and he would have to pay more for his new loan even if he could get it. At worst, he might not be able to borrow it at all. In that case the only solution might be to sell the farm.

Dependent on their investment programme, insurance companies and building societies are at times prepared to make long-term loans on agricultural properties. The principal consistently willing lender of long-term uncallable loans for this purpose in England and Wales is the Agricultural Mortgage Corporation. Through times of plenty and of credit squeeze, the the A.M.C. has always been a willing lender where the intending borrower has been credit-worthy and has been able to prove a genuine need to borrow for agricultural purposes. Moreover, the A.M.C. is the principal substantial source of long-term finance which injects into agriculture long-term capital obtained from outside the industry. It may be regarded as a kind of reservoir into which, by the issue of Debenture Stocks on the market, funds are drawn from insurance companies, pension funds and other institutions as well as from private investors. From this reservoir, these funds flow out to landowners and owner-occupiers in the form of long-term uncallable loans.

Need for research into finance in agriculture

The examination of the financial structure of the agricultural industry is hampered by the absence of comprehensive and reliable statistical information regarding the value of fixed and floating assets, the amount and sources of credit and the amount of each type of tax levied on the industry. Almost all assessments of the financial structure depend on very limited factual statistics supported by individual writers' estimates. These estimates vary widely in reliability as do the conclusions drawn from them. A comparatively small expenditure by the industry itself or from public funds could remedy this position with a more than proportionate benefit to the results of research into the subject of finance in agriculture.

'Agriculture'

Change of Publication Date

Readers will be pleased to hear that, commencing from the July, 1968 issue, their copies of *Agriculture* will be available from the third day of the month for which the issue is intended.

Grassland Dairying

R. M. Ecroyd

In dairying today two different views are emerging, the traditional and the grassland. With devaluation increasing costs and the possible role of agriculture as an import-saver increased utilization of pasture must lead to lower costs.

The grassland school of thought, although it has achieved low costs, a simplicity of management and a high return on capital, has never made the breakthrough into sufficient gross output by exploiting high stocking rates. This is the objective of our system. We must also face the fact that to a trained mind its simplicity and ease of management imposes an unbearable self-discipline to fight the inclination to take on subsidiary enterprises.

The basis of our system is the 100-acre farm unit carrying about a cow per acre, on half a ton of bought-in concentrates, with the land all in well-fertilized grass sub-divided into 20 paddocks, and the cows self-feeding silage in winter. Within this framework of grassland dairying, the following factors have only a marginal influence on net production and in some cases are only a commonsense adaptation to a particular farm, or reflect the temperament of the farmer.

1. Cows being outwintered or housed in yards, cowsheds, cubicles or kennels. This is decided by soil type and winter rainfall.
2. Breed of cow, individual records and identification.
3. Type of milking parlour, be it movable bail, fixed abreast parlour or herring-bone and bulk tank.
4. Method of silage making, whether wilted, vacuumed, double chopped or buckraked.
5. Type of concentrate feed or usage above half a ton per cow in the presence of adequate bulk forage.
6. Leys or permanent pasture, whether irrigated or not.
7. Clover versus artificial N.
8. Electric fences or permanently fenced paddocks.

The choice of each of the above should be determined by the farm, the local climate, the available labour and to make the best possible use of available capital. It is nonsense to indulge in such things as a sophisticated silage-making system and slurry handling equipment if this would divert capital from buying extra cows.

Food, both bought-in and home-produced, accounts for two-thirds of dairying costs. All other items account individually for a relatively small fraction. If feed, being the major item of cost, can be redeployed to feed more cows not only will output rise but the cost per gallon will fall.

Maximum utilization of grassland and maximum animal performance are not compatible because of the seasonal growth of grass. The nearest we can get to achieving maximum output is by tailoring the individual animals' lactation curve to the growth of grass. This is done successfully in the production of lamb and with a degree of success in summer milk production. As there are two grass-growing peaks in the year it is better to lower the number of cows calving to one seasonal period of growth and to calve additional numbers to the other peak of growth.

Spring calving has the defect of calving at a time when it is all too easy to have the cows on a falling plane of nutrition due to late winter feed shortages. There is also the possibility of midsummer drought lowering yields and so precluding full utilization of autumn grass. Milk prices are low during the period of high production.

July-August calving utilizes the autumn grass but cows can easily fail to flush the following spring. The July/August calving cow gets back easily into calf on grass in October and so maintains a 365-day calving index. Calving in July-August is normally considered unsuitable in high rainfall areas where grassland dairying is usually found; it also clashes with corn harvest and the traditional holiday period. A cow calving at the more normal time in October cannot utilize the low D.M. bulk of the autumn grass. Grassland management is critical in autumn because the grass is unpalatable unless it is cut or grazed hard in August and then adequately supplied with nitrogen.

We have ourselves moved from 80 cows per 100 acres calving at one season to 130 cows per 100 acres, half calving in the early spring and half calving in the late summer. This has resulted in much more feed being available for freshly-calved cows and a reduced, seasonal work load on the stockmen. This technique can be developed further, without buying in feed, by shortening the lactation from the usual 10 months to perhaps 8 months and using dry cows as scavengers. This is a real possibility as only one-sixth of a cow's annual output is produced in the second half of the cow year, the value of the calf being included in the first half.

The implications of this are enormous. A longer dry period means better pasture utilization. Grass that has been trampled or refused by higher-producing stock can be utilized. Calving date is critical as the capacity to take in dry matter does not reach its maximum until 10 weeks after calving. A cow in the early stages of lactation is a more efficient converter of nutrients into milk than a cow in late lactation. By increasing the number of freshly-calved cows and reducing the number of cows in late lactation the milk output, less bought-in feed, may rise above £120 per acre in spite of having more dry cows. A high stocking rate will result in a high acre output but the higher the stocking rate the greater will be the influence of these factors.

As we are freed from the concern of high individual animal output we can more easily observe a proper rotational defoliation of our pastures. This is

important during dry weather, or other adverse growing periods, when the temptation to hold up herd production by rapid acceleration of rotation must be resisted, otherwise subsequent grass yields will be low. If grass growth was a linear, time to yield relationship, this would be unimportant, but its sigmoid graph shape suggests that we should pay much more attention to the timing of defoliation and so allow the growth of the leaf area to maximize light interception to produce high yields of digestible D.M. and fully convert nitrates into proteins. Perhaps the zero-grazer or storage feeder, because of machinery limitation, does this unintentionally whereas it is so easy to allow random rotation of immature grass with grazing stock. In paddock grazing, with the complication of the reintroduction of the silage area, a sequence calculator which allows for the reintroduction of the cut pasture, is a necessary tool of the intensive grazier.

We are still under-rating the effect that the stockman has on herd performance; perhaps after feed supply this is the second most important factor in profitable dairying. Up until now the big difference in herd performance has been credited to other factors, the use of specialized feeds, superior breeding, etc. This is understandable because it is only noticeable and measurable in multiple herd organizations where other factors such as land, fertilizers and feed management are constant. On our own farms the average difference between our top three herds and our bottom three herds is 18,500 gallons of milk or £3,000 per herd. In the really big herds which are being planned it is doubtful if a good individual can produce this plus factor as the tendency will be to submerge the competent individual into an average operator. Farming is the last big industry where any individual on the shop floor can express his ability. We must encourage this, capitalize on his interest and not reduce him to yet another unit of manpower.

This article has been contributed by **R. M. Ecroyd,** who farms 1,400 acres in Herefordshire, carrying 1,600 cows, in 13 herds.

Recommended List of Grass Varieties

The Council of the National Institute of Agricultural Botany has approved the first N.I.A.B. Recommended List of grass varieties and a Farmers' Leaflet describing these will be published in early June.

Each year since 1960 the Institute has issued a Farmers' Leaflet on grass varieties. Initially this was a simple descriptive leaflet but since 1963 good representative varieties for each species have been printed in bold type. It is felt that the time has come to give this leaflet the status of a Recommended List both because of the more extensive trials programme now in operation and because of the demand for positive advice on the choice of varieties.

The List comprises the recommended varieties of perennial ryegrass, Italian ryegrass, hybrid ryegrass, timothy, meadow fescue and cocksfoot. Most of these species are subdivided into maturity groups and recommendations are made within each group.

Copies of the leaflet are available from the N.I.A.B., Huntingdon Road, Cambridge.

Close Company Distributions—Requirements of the Business

G. H. Camamile and E. S. Carter

In a previous note on close companies reference was made to the rules under which close companies, which have distributed less than the 'required standard' appropriate to their circumstances, can be assessed to income tax on an amount representing the distribution which they should, or could, have made. This type of assessment is generally referred to as a 'shortfall assessment'.

The general rule is that if the distributions from a close company for its accounting year (accounting period) are less than the required standard for that year, the company will have to bear a charge to income tax on the amount by which the distributions fall short of that standard. 'Distributions' include, inter alia, dividends for the period in question and paid during it, or within a year of its end, and any directors' remuneration paid for the period which exceeds the limits prescribed for close companies. Reference to these limits was made in an earlier article.

The required standard for a year or other period is the distributable income (broadly equivalent to all the taxable income) of that period, 'less so much of that income (not exceeding in the case of a company which is neither a trading company nor a member of a trading group, the amount of the estate or trading income) as the company shows could not be distributed without prejudice to the requirements of the company's business'. In no case, however, is the required standard to exceed 60 per cent of the estate as a trading income, plus the whole of its distributable investment income.

Estate or trading income includes the income from a trade (e.g., farming) and any income from rents from land or buildings. Investment income includes interest and dividends. It is important to note that a trading company can, of course, have investment income as well as estate or trading income, and that it is possible for a trading company to justify the retention of investment income as well as of estate and trading income. This is an important distinction between the circumstances of an investment company and those of a trading company. An investment company cannot justify the retention of its investment income, whereas a trading company can do so.

Most farming companies are trading companies because they exist wholly or mainly for the purposes of carrying on a trade and, further, their income would not consist mainly of 'unearned' income.

In a trading company, therefore, the maximum distribution which may be taken as the required standard is 60 per cent of the trading income plus any distributable investment income. For a trading company which is completely independent and has only a small profit there is a further relaxation of the maximum required standard. If the trade (or rental) income for an accounting year of an independent trading company (that is one which does not have an associated company, specially defined) does not exceed £1,500 then that income will be disregarded in determining the maximum required standard and if it is between £1,500 and £9,000 a deduction of one-fifth of the difference between £9,000 and the amount of that income is given, the maximum standard being determined by reference to that reduced amount.

If there is investment income this has to be taken into account in determining the maximum standard and is not affected by the exemption or abatement of the estate or trading income. However, the distributable investment income, which is the amount to be included in the maximum standard, is the investment income less a deduction of the lesser of £200 (for a twelve-month period) or 10 per cent of the estate or trading income.

In arriving at the required standard for any accounting period, there are to be taken into account not only the current requirements of the company's business but also any other requirements necessary or advisable for the maintenance and development of that business. There are, however, certain kinds of outgoings which are not treated as being applied to the requirements of the business, and these need to be noted carefully. They include expenditure incurred for the acquisition of the business or assets which the company was formed to acquire or which were, in fact, the first substantial business or assets the company acquired. Not only is the actual payment for acquisition included, but also the repayment of any share, loan capital, or indeed, even any bank borrowing incurred in respect of the acquisition.

The question with which every farmer carrying on his trade through a company will be concerned is how, except for these special cases which are specifically dealt with, the Inland Revenue, through its Inspectors of Taxes, will approach the question of whether a company can or cannot distribute without prejudice to the requirements of its business. Some practical considerations bearing on this question will be discussed in a later note.

The July issue of 'Agriculture' will include an article 'Close Company Distributions — Some Practical Considerations'.

Trial spraying pre-emergence herbicides on broad beans

Broad Beans for Processing

G. P. Gent

DURING the 1967 harvest considerable efforts were made to perfect the technique of vining broad beans from the haulm using modified mobile pea viners. The other aspect of broad bean production which called for improvization of existing equipment or hand labour was planting. Generally, broad beans are too large to pass through the normal feed mechanism of force feed drills and in the past probably the most widely used implements for planting broad beans were modified potato planters. However, some drill manufacturers have now developed metering mechanism to handle the broad bean seeds, and in Holland bulb planters have been used successfully to sow the crop. These developments should allow broad beans to be grown on a far larger scale than hitherto when hand labour for planting and for stripping pods from stems often restricted the acreage that could be grown.

Research

Broad beans are a very attractive crop to many farmers as they combine the cropping reliability of vining peas with the vigour of field beans. They possess the inherent advantages of leguminous crops in that they are not affected by cereal diseases, they enrich the soil with nitrogen from their root nodules and annual grasses and broad-leaved weeds can be controlled by selective herbicides. In addition, as the beans are harvested when the plants are green the soil benefits considerably from ploughing-in the spent haulm.

Currently about 10,000 acres of broad beans are grown annually in this country, but recent trial results have demonstrated how the beans can be made more attractive to the consumer and so increase the demand for the crop and the acreage grown.

Research on broad beans has been carried out by the Pea Growing Research Organisation since 1963 and one of the most important investigations to date has been the establishment of the relationship between sowing and harvesting time. In the past, broad beans were sown without controlled sowing programmes, often resulting in many fields being planted at the same time in early spring. The weakness of this system was that the

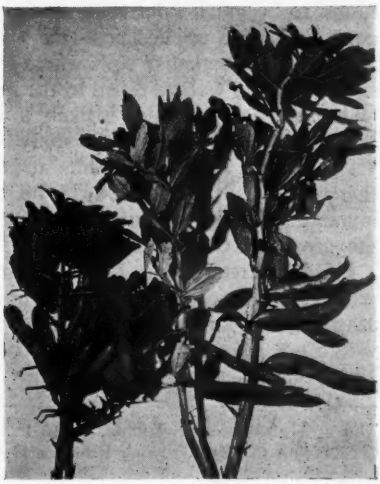
beans often matured at the same time as the last sowings of vining peas. The processors being unable to deal with both crops together often had to leave the beans so that they were too old by the time they could be processed, and in extreme cases they had to be left to mature dry for seed.

At the time P.G.R.O. commenced trial work on this subject it was generally believed that staggered sowings would not give an orderly succession of beans at harvest. As broad beans are insect pollinated, rather than self pollinated, as in the case of peas and dwarf beans, it was thought that the time of harvest was related to the time and incidence of insect activity rather than sowing time. However, it was found that beans planted as early as practicable under most conditions (early February) came into flower in mid-May with an adequate supply of pollinating insects. Broad beans planted progressively later matured in an orderly fashion and gave continuity of supply in a similar way to vining peas. Again, as with vining peas, early May was the limit of lateness for consistently successful crops.

Sowing time and variety

Currently the most popular variety is Triple White. This has white flowers and gives a pale seed at harvest which does not discolour after cooking. Occasionally 'rogues' with coloured flowers can be found in crops of Triple White and these have to be removed as produce from these plants turns brown on cooking. P.G.R.O. variety trials have, in addition to demonstrating new varieties to replace Triple White, shown that there are varieties which mature up to 7 days before, and others up to 7 days later than Triple White. These varieties, when used in a planned sowing programme, should give a similar flow of beans to processing factories as can be obtained with vining peas.

When these developments are fully adopted by the processing industry they will allow a better and more consistent quality pack to be produced. However, their use will call for much co-operation between farmers and processors, but the final result of a consistently more attractive sample for processors to sell, together with less likelihood of farmers having to seed



Photograph showing dwarf and broad beans

crops down, will be mutually beneficial. In addition, interesting varieties have been tested which could replace Triple White and give a more attractive pack, so increasing the demand for the crop.

The variety Staygreen is exceptional in that the fresh bean has a bright green colour which is retained after cooking. This makes it particularly attractive for freezing and when canned with small quantities of artificial colour it gives beans of similar colour to dark seeded vining peas.

Improvements in flavour are more difficult to define, partly because this is a very personal consideration and partly because broad beans have a strong and distinct flavour. People liking this strong flavour would consider a further increase in flavour desirable, whereas those without this appreciation of the broad bean flavour would consider a further increase undesirable. The varieties Primo, Comprimo and Praecox have coloured flowers making them suitable only for freezing and are considered by many people to have superior flavour to Triple White.

Another approach to broad bean breeding, this time aimed at making the direct vining easier, has been the development of very dwarf varieties. The variety Compacta is an example of this genotype and has all the pods concentrated on a small part of the stem. This means that less haulm has to be fed into the viner to carry all the pods and there is less damage to the viner screens from the woody stems.

Other research

Another problem, purely cultural, which P.G.R.O. research has minimized is the control of annual broad-leaved weeds on organic soils.

On mineral soils the material simazine, such as Gesatop and Bladex gives excellent control of annual broad-leaved weeds, but simazine together with the great majority of pre-emergence herbicides is inactivated by high levels of organic matter. Consequently a post-emergence treatment is necessary for chemical control of weeds on peat soils. Dinoseb-amine has been used to a limited extent, but has been applied at high volume to minimize scorch, and in P.G.R.O. herbicide trials the related material dinoseb-acetate has been found to be much safer than dinoseb-amine and to give satisfactory weed control. As it is applied post-emergence it can be used safely on peat soils and light, non-retentive soils where there is a danger of crop damage from simazine being washed down to the root zone.

An investigation which is likely to increase both returns and profitability of the broad bean crop is the study of plant populations. These trials have yet to be completed but results at present suggest that higher populations than are used at present will be more profitable. This trend towards higher populations appears to be greater for relatively dwarf varieties such as Staygreen and Compacta.

P.G.R.O. research is financed through the levy subscribed jointly by growers and processors of leguminous crops. The trial work is mutually advantageous and many new varieties, herbicides and cultural techniques would not have been established so quickly, and in some cases would not have been pursued at all, but for the efforts of this specialized body.

This article has been contributed by **G. P. Gent, N.D.A., M.R.A.C.,** who is a Technical Officer with the Pea Growing Research Organisation Ltd., Research Station at Thornhaugh, Peterborough.

Slurry Storage—

under high rainfall conditions

Michael Haines **D. M. James**

THE advent of cubicle housing of dairy cattle and the consequent reduction in the amount of bedding used has brought to many farms the problem of slurry storage and handling. In a high rainfall area, this problem becomes even more acute.

The Towy Valley of Carmarthenshire is such an area. Its annual rainfall is about 60 in., it is very flat and the water-table is high. In winter, it is impossible to spread manure every day as much of the valley is too wet to permit the use of machinery on the land. Consequently, slurry storage, which is both difficult and expensive, has become unavoidable.

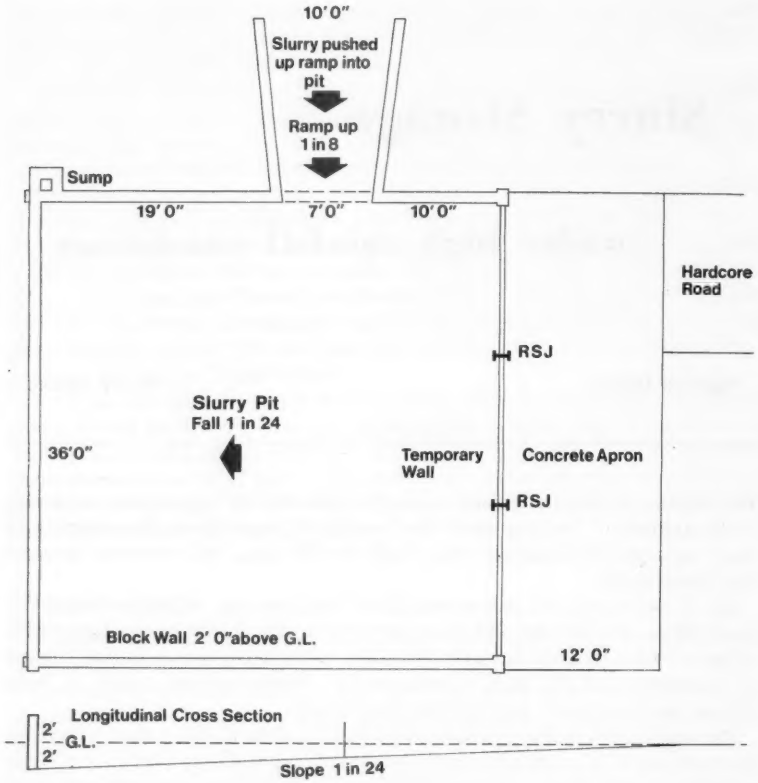
On many farms in the area there is no natural slope to allow the inexpensive construction of a slurry pit merely by means of a retaining wall at the lower end of the slope. Recourse must therefore be had to more complicated and costly construction, involving excavation, walling and ramps. One such system that has recently been designed for a farm in the Towy Valley has operated successfully throughout the past winter. It offers a useful illustration of a workable system and its operation.

Slurry storage had to be provided for a period of at least eight weeks for a herd of 48 dairy cows housed in cubicles bedded with sawdust and shavings. The cows were self-fed on silage, supplemented by hay, and the slurry produced in the feeding area also had to be contained. Rainwater from gutters and down-pipes on all buildings was excluded from the slurry. As far as possible, the cows were also kept entirely under cover. This effort was worthwhile, since it reduced the bulk of the slurry to be stored and also kept it in a more solid state for handling with a foreloader.

Layout

The diagram overleaf shows the layout which was adopted.

A pit 36 ft square was excavated to a maximum depth of 2 ft. It was lined with concrete blocks to a height of 2 ft above ground level. This permanent walling was provided on only three sides; on the fourth side, 10 in. R.S.Js were embedded in the concrete floor so that a temporary wall of timber could be erected. The floor of the pit had a slope of 1 in 24, and the capacity



of the pit was about 144 cu. yd. Beyond the timber wall, a concrete apron 12 ft long was provided for the easy access of machinery to empty the pit.

On the side of the pit nearest to the cubicle shed and at right angles to it, a ramp with a slope of 1 in 8 was constructed so that the retaining walls projected 18 in. above the level of the ramp. The pit is filled by pushing the slurry up this ramp with a rear-mounted tractor scraper.

Operation

The pit has been emptied twice during the winter 1966–67. On both occasions a hydraulic swing boom excavator fitted with a front bucket loader and rear-type digger was hired at a cost of 25*s*. per hour to remove the slurry from the pit. At the beginning of the operation, the rear-mounted ditching-arm was used to work over the timber wall. As the work progressed and the slurry level fell, the timber wall was gradually removed until it was possible to operate the fore-mounted 6 ft bucket. Two buckets filled a 'Rota Spreader' which the farmer shares with a neighbour. The table below shows details of the two emptying operations which varied quite considerably.

	First Emptying	*Second Emptying*
Number of cows	50	60
Time taken to fill (weeks)	9	11
No. of spreaders used	1	2
No. of loads to empty pit	48	48
Time taken to empty (hr)	12	8½
No. of loads per hour	4	6
Hire charge for loader and man*	£15	£10
Cubic feet/cow/day	1¼	1

*N.B.—The contract charge is a special rate for out-of-season use when the hydraulic excavator and driver would not have alternative work.

The pit filled more quickly the first time when there were less cows, and when no attempt was made to exclude from the pit hay from the racks and silage waste. After this experience, the farmer made sure that all waste, long fodder was excluded, since apart from increasing the bulk of the slurry, it reduced its flow and made handling and spreading more difficult.

The number of loads on both occasions was the same, but the time taken to empty the pit was reduced by a third when two spreaders were used. The extra spreader, loaned by another farmer on a reciprocal basis, reduced the cost of hiring the hydraulic loader and man since the digger did not rest idle between loads.

Conclusions

This system was designed for 48 cows, allowing between 1 and 1½ cu. ft of storage per cow per day, the normal provision for planning purposes. However, as the table reveals, the herd had already grown by the time the pit was first emptied, and it increased to 60 cows by the time of the second emptying. Consequently, even allowing for the precautions now taken to exclude long fodder from the slurry, the pit is too small to provide storage for the length of time required.

The farmer now feels that 48 ft square would be a better size for the herd he now has, and he intends to increase the pit's capacity by removing the

Scraping slurry up the ramp and dropping it into the pit

temporary wall and continuing the side walls to enclose the apron. This will make the pit 48 ft by 36 ft, and will also eliminate the necessity of hiring a loader to empty it. The farmer has found that, as long as a concrete block is attached to the rear of the tractor, it can empty the pit using a foreloader with ram-operated bucket, the slope of 1 in 24 presenting no obstacle.

The important point about this system is that it works. It demonstrates that in areas of flat land and high rainfall, slurry storage need not present an insuperable problem, and several useful lessons can be learnt from this case.

1. This experience indicates that in constructing such a pit, approximately 120 cu. ft capacity per cow should be provided for 60–70 days storage. It is worth noting that if the herd size is at all likely to increase, provision should be made for this when the system is designed.
2. The slopes must be satisfactory—i.e., ramp not more than 1 in 9, fall in the pit floor about 1 in 24. This fall is sufficient to make the slurry flow but not too great to prevent a tractor working on it.
3. As long as the areas where slurry is produced are covered and drainage water is excluded from the pit, it does not appear to matter how much rain falls on the pit. The slurry forms a skin off which rain will flow, and provision should be made to allow this rainwater to drain away.
4. Long fodder such as hay and waste from the silo should be excluded from the pit to reduce volume.
5. The pit should be emptied whenever the weather is suitable for field-spreading. It should not be allowed to fill completely, or there will be no reserve for a long spell of bad weather.

The authors wish to acknowledge the assistance given by Mr. W. S. Shattock, Regional Mechanization Adviser (Wales)

M. Haines, B.Sc.(Agric.) (Leeds), is a District Advisory Officer for the N.A.A.S., and his co-author, **D. M. James, F.L.A.S.**, Senior Assistant Land Commissioner for Carmarthen.

The Ministry's Publications

Since the list published in the May, 1968, issue of *Agriculture* (p. 241) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin No. 161. British Poisonous Plants (Revised) 11*s.* (by post 11*s.* 8*d.*)
Bulletin No. 164. Hop Growing and Drying (Revised) 11*s.* (by post 11*s.* 8*d.*)
Mechanization Leaflet No. 19. Potato Harvesting with complete Harvesters (New) 1*s.* (by post 1*s.* 3*d.*)

FREE ISSUES

ADVISORY LEAFLET

No. 554. Paddock Grazing for Dairy Cows (New)

SHORT TERM LEAFLETS

No. 72. Weed control in Horticultural Brassicas (New)
No. 74. Cow Identification (New)
No. 75. Bolting in Brassica Crops (New)

UNNUMBERED LEAFLET

Faulty Spraying—How to Avoid it (New)

The priced publications are obtainable from Government Bookshops (Addresses on p. 308) or through any bookseller. Unpriced items, are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Feeding Sows

W. M. R. Evans, *Director, Trawscoed Experimental Husbandry Farm*

A SIGNIFICANT feature of sow feeding on commercial farms of recent times has been the move away from group feeding to individual feeding. No longer is the shy sow at the mercy of the bully. Each sow has her pre-determined rations whether she be housed in stalls or is group-housed but is fed in a battery of individual feeders.

Now that sow feeding has become more precise at the pregnancy stage as well as the lactation stage, one needs to establish standards of daily feed intake at both of these stages and the possible variations in periods at these two stages.

Basically, we need to clear our minds and establish a priority rating in our objects for keeping sows.

Our sole object in keeping sows is obviously to produce weaner pigs. But how many weaners should we be content with and what size? And what of the sow? Can a good level of production be obtained from a sow in 'toast-rack' condition, or is it necessary for the sow to build up high condition during pregnancy to 'milk-off' her condition during lactation?

It is not easy to evaluate the relative importance of these factors, but it would seem that the best yardstick to assess a sow feeding system is the cost of production of a weaner of a given weight, which might be anywhere between 30 and 40 lb, provided this weaner has the potential to produce an economical carcass.

P.I.D.A. figures give the average cost of a 40 lb pig at about £5. This is equivalent to 3*s.* 9*d.* per lb of carcass, compared with approximately 2*s.* 6*d.* per lb for a quality bacon pig. That the carcass cost per lb of weaner should

be higher than that of a baconer one would not deny, but it is obvious that the nearer we can get to a production cost of 2*s.* 6*d.* per lb dead weight for the weaner the better.

As feed represents approximately 75 per cent of the total cost of the weaner, it is obvious that the main attack must lie in reducing the feed cost of the weaner through the sow.

Surveys have shown that the average annual feed consumption per sow is 32 cwt for the production of 14 pigs averaging 38 lb live weight. Probably 10 lb of the weaner weight would have come from creep feed in any case. This leaves an annual production from the sow herself of 392 lb of piglet for every 32 cwt of meal, giving a conversion rate of 9 : 1. This is relatively low efficiency compared with a baconer with a conversion rate of 3·5 : 1. But this is not the whole story, as there is considerable weight loss and weight gain in lactation and pregnancy periods respectively.

However, we have to acknowledge that this weight variation does occur in the sow through pregnancy and lactation, and try to assess what level of weight gain and loss is desirable. A further consideration in determining levels of nutrition in these two important periods is the allowance to make for growth to mature size. It is fairly obvious that some increase in actual body weight is necessary during pregnancy, over and above the weight loss which occurs at farrowing, if the development of the litter is not to be affected.

Research at the Rowett Research Institute has shown that when the gain in net body weight of sows (less litter and afterbirth) are reduced from about 100 lb to 10 lb, there was a reduction in litter weight at birth by 5 lb.

However, when the gain in net body weight was reduced to about 40 lb there was no reduction in litter weight at birth. From this it might be concluded that for normal reproduction the sow should gain between 10 and 40 lb over and above the product of conception. To allow for a margin of safety a body gain of 45 to 50 lb would appear to be desirable. Add to this a figure of 40 lb to cover litter and afterbirth then it would appear that during pregnancy a sow should gain 85–90 lb without any adverse effect on the litter produced.

Normally there is a loss of weight during lactation. If this loss of weight exceeds 50 lb the sow will become progressively lighter with succeeding litters. It has been estimated that if a sow is to approach mature weight she should increase her net body weight by 25–30 lb during each reproductive cycle. This would allow her to reach 400 lb after five litters.

If this is accepted as reasonable then it is clear that during lactation the level of feeding should be such that the loss of body weight should be limited to about 20 lb.

Of course the same position could be achieved by feeding to allow a net pregnancy gain of 100 lb followed by a lactation weight loss of 70 lb. When this level of feeding was compared with that which led to a gain of 50 lb in pregnancy and a loss of 20 lb in lactation it was clear that the latter gave some 15 per cent better food utilization.

The conventional method of estimating the energy requirements of livestock is to add to the maintenance needs of the animal those for production. For the pregnant sow this would involve the growth of the litter and membranes as well as her 45–50 lb body gain, and in the case of the lactating sow, the requirements for milk production.

When this calculation is made and sows fed the stated quantity of meal, it has been shown that the liveweight gain of the pregnant sow is far higher

than it ought to be. Research at the Rowett Institute and in France has shown that the pregnant sow is more efficient in food conversion than a dry or empty sow. The results of this research, in both instances, showed clearly that the feed allowance sufficient to maintain body weight in an empty sow will allow a pregnant sow of the same weight to produce a litter and gain, in addition, 45 lb body weight.

A further question relative to the plane of nutrition during pregnancy is how important is it to vary the feed intake at different stages of pregnancy? Traditionally, farmers have considered feeding during early pregnancy to have an influence on litter numbers and during late pregnancy to influence the size of the individual piglets.

At the Rowett Institute three separate groups of pregnant sows were fed the following daily amounts of meal:

A 3 lb; B 6 lb; C 3 lb for first two-thirds of pregnancy, followed by 6 lb for last third of pregnancy.

Those given the 3 lb ration produced lighter litters than either of the other two groups, between which there was no difference. It did not, therefore, seem to matter whether the sows ate 3 or 6 lb of meal per day for the first 76 days of pregnancy, but it did matter during the last 38 days.

Whether only part of the 38-day period was critical and whether the full 6 lb allowance was required, could not be gauged from this particular experiment.

A further trial involving pregnant sows fed widely different allowances (3, 6 or 9 lb meal per day) during the first month of pregnancy, showed no effect of feed level on embryo survival.

Trials at Experimental Husbandry Farms, where groups of pregnant sows were fed 4, 6 or 8 lb of meal daily through gestation, also showed no influence on litter number at birth but an increase in individual piglet size as daily level of meal increased.

The extra requirement of the developing piglets in late pregnancy is not very great and for practical purposes if 4 lb per day of meal is given during the first three months of pregnancy then 5 lb should be given during the last month.

The conditions under which sows are kept and housed will have an effect on general level of feed required. Pigs kept under hard exposed conditions might require a higher level than that mentioned, whilst those housed in a deep strawed yard or in sow cubicles, might perform equally well if the daily intake was reduced by $\frac{1}{2}$ lb.

The level of nutrition during lactation has not been the subject of as much research and investigation as that during pregnancy.

However, there is an indication from work carried out at the Rowett Institute and on Experimental Husbandry Farms that feeding sows on a level of nutrition approaching *ad lib* was not economic. This level of feeding produced litters weighing 30 lb heavier than litters from sows which consumed 2 cwt less meal during the eight-week lactation period.

A trial is now running at Experimental Husbandry Farms in which sows are fed 4 lb, 6 lb or 8 lb per day of meal during pregnancy and are further sub-divided during lactation, so that half the sows in each pregnancy treatment receive either $10\frac{1}{2}$ lb of meal daily per sow and litter up to 4 piglets, plus $\frac{1}{2}$ lb for each additional piglet or 7 lb of meal daily per sow and litter up to 4 piglets, plus $\frac{1}{2}$ lb for each additional piglet. This tends to indicate that a pregnancy level of 6 or 8 lb meal daily irrespective of lactation level of feed

gives a weaner cost of approximately 3*s.* 11*d.* per lb dead weight. On the other hand, sows receiving 4 lb of meal daily during pregnancy produced weaners costing 3*s.* 1*d.* per lb dead weight at the lower lactation plane of nutrition and 3*s.* 5*d.* per lb dead weight at the higher lactation level of feeding. The number of weaners per litter at 8 weeks were very similar for each level of pregnancy feeding, namely 8·4; 8·6; 8·5 respectively for the 4 lb; 6 lb and 8 lb daily intake of meal during pregnancy.

Hinton Chicken Growers Ltd.

J. H. Styles

In the summer of 1963, the chicken industry was in the doldrums: the smaller packing stations that survived were kept going by a few loyal and optimistic producers who waited weeks for payment, often leaning heavily on feed merchants for credit. It was in such circumstances, that a far-sighted director of a feed firm arranged a meeting of producers, hatchery proprietors and the owner of a small poultry packing plant. This meeting led to the foundation of a co-operative association—Hinton Chicken Growers Ltd., with their head-quarters at Norton St. Philip, Bath, Somerset.

Backed and advised by the Agricultural Central Co-operative Association Ltd., largely financed by one of the large banks, the Company commenced operations in October, 1963, and at the end of the first twelve-week trading cycle showed a loss, even though the producers had been paid somewhat less than the calculated cost of production. In such circumstances, things could only get better and ever since producer members have been paid appreciably more and sometimes a lot more than their costs.

Organization

Policy is decided by a board of directors elected by the members. Of the total of seven it is mandatory that at least four must be producers. Since its formation, three places have been filled by the feed firm director, a hatchery

proprietor and the owner manager of the packing station, an arrangement convenient for the ready exchange of information on which to base decisions. The board meets as often as is necessary, at least once every twelve weeks. It is interesting to note that of the seven members of the committee at its inception, four have since given continuous honorary service as directors.

At general meetings, held annually, when accounts are presented, members have the opportunity to replace a proportion of the directors if they desire and elect further directors to fill any vacancies. The working of the company is discussed and approval sought for any major changes of policy. Interim general meetings are called when it is desirable.

A contract between the company and the packing station provides that the latter only processes and markets chickens on behalf of the former, which in turn guarantees to provide the number of chickens required each week to conform with a pre-arranged schedule. Day-to-day operation is the responsibility of the manager of the packing station.

Producers sign a contract to rear day-old chicks in accordance with the schedule which is prepared six months in advance and within limits of flexibility provides an accurate guide for regular throughput. The day-old chicks are ordered by the company from three associated hatcheries and supplied direct by them to the appropriate producers. These hatcheries have a good geographical separation, as have also the producer members, so that any movement restrictions because of disease are likely to be limited in their effect on production. A contract with each hatchery provides safeguards for both sides.

Contracts continue in force until notice of termination is given. Six months' notice is specified in the contract with producers and twelve months in that with hatcheries. If, however, there is a serious breach of a contract by either party, it can be terminated at 28 days' notice with provision for arbitration in the event of disagreement. Such circumstances have not yet arisen and do not seem likely to occur.

Producers are tied in so far as their day-old chicks must be obtained through the Company at specified times and the grown products submitted to the packing station in accordance with the schedule, but there is no other surrender of individual sovereignty. They have complete freedom as to their choice of food and system of management. If a grower habitually produced chickens below the standard required, it is most likely that financial losses would force him to cease production, but if necessary, his contract would be terminated. The restrictions are minimal and really less than are usual: many hatcheries require a four-crop order and packing stations a twelve-month contract. In practice, minor alterations to the schedule can usually be arranged if requested by producers.

Finance

Each member has a number of shares in the company which bear interest at the rate of 7½ per cent, the maximum allowed under the A.C.C.A. rules. This interest, with its associated income tax, is the only 'profit' made by the company; all other income not expended on essential workings is paid to members, with a share to the packing station, for their production. Every week the company pays the packing station a sum estimated to be its normal weekly costs including salaries, wages, transport, packaging materials, depreciation, etc.

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Within a fortnight of the collection of a producer's chickens, he is paid an amount per lb live weight of chicken which is determined at the beginning of each twelve-week period as being approximate to the amount which will be realized and available after expenses have been met. Except for the first period in the life of the company, this figure has not been below the calculated costs of production, nor have there been any delays in payment.

At the end of each period an accountant prepares a Trading Account, balance sheet and any specific details required for guidance of the board which may affect policy or require investigation to improve working. The amount of money remaining, after producers have been paid the calculated costs of production and the costs of the packing station with any incidental expenses that have been met, is then divided between the packing station and the producers in the ratio of 1 : 3, individual producers being paid according to the live weight of the chicken supplied. The ratio is in accord with the capital invested, it being assumed that an investment of 10*d.* is required to process a chicken and 30*d.* is required for producing.

Progress

From an original throughput of about 20,000 birds per week, the number has progressively grown to about 65,000, an indication that many producers find the system attractive. Expansion has, of course, brought problems and in the past four years it has been necessary to increase the size of the packing station and to provide more and better equipment and facilities. When necessary the company assists the packing station in financing desirable projects. Recent improvements have further enhanced the quality of the chicken and Hinton Chicken is a most attractive well-packed item for the housewife.

In the beginning, producers arranged their own supply of day-old chicks and on occasions, sometimes for reasons beyond their control, failed to provide birds of the required quality or in the numbers required at the scheduled time. For efficient operation it is essential that a regular known throughput is maintained. Some two years ago it was decided that the company would arrange the supply from the associated hatcheries who all now supply the same kind of chicks which are considered the best for our purposes.

Development

While no sudden expansion is contemplated it is anticipated that as the market grows Hinton Chicken will endeavour to keep its share. Meanwhile, consideration is being given to the possibility of further integration. The prosperity of the packing station depends on the prosperity of the company and thus the producers; when the producers benefit, the packing station also gains. Close association exists with the hatcheries and there is a somewhat looser link with the feed merchants interested in the well-being of the company. It is hoped that shortly stronger ties will be forged and a method developed that enables the firms to share both prosperity and adversity with the producers. Whilst compulsion as to the provision of chicks and adherence to the production schedule is necessary for the well-being of the company, further compulsion is not desirable, but it is hoped that any scheme will be attractive enough to interest the majority of the producers.

General

It must be apparent that this is a producers' association run primarily by producers who obviously benefit by an assured market for their produce and their proper share of any returns. That this is appreciated is shown by the growth of the company and the fact that apart from one member, all resignations have been those of producers that have ceased operation for various reasons and that many applications for membership have had to be deferred because the output cannot be fitted into the existing programme. Should there be any interest in forming similar associations, the directors will be pleased to respond to any questions to which their experiences may provide the answer.

This article has been contributed by **John H. Styles, O.B.E.**, Vice-Chairman of Hinton Chicken Growers Ltd., who specializes in the rearing of poultry and pigs in Chippenham, Wiltshire, where he has farmed since 1952. During the period 1957–63 he was the Ministry's Market Reporter for the Chippenham area.

Grassland Records

G. W. Furness

PROGRESS and success in any business depend on the early identification of opportunities to be explored and problems to be tackled. In grass and livestock farming, simple field records can be of great assistance in this identification. With stock moving from one field to another and with part of the production from some fields conserved as hay or silage, it is impossible without records to tell which fields contribute most to the requirements of the herd or flock.

Figures of output per acre for a whole farm, whether measured as cow-days or in terms of utilized starch equivalent, are chiefly of interest to advisers or educationists. This is true, especially, where overall performances or individual field results from a number of farms have been analysed and related to different management practices. For example, surveys have provided information on the general effectiveness of increased nitrogen applications and of different seeds mixtures.

The individual farmer may or may not have sufficient fields to observe valid differences in production with differing treatments, but he can discover many other features of grass production and utilization on his farm by careful interpretation of field records. A discussion of recent results for the College

farm of Seale-Hayne Agricultural College will demonstrate the value of these records. Since 1964, the cow-day method of assessing the outputs of different fields has been applied. The procedure has been based on that recommended by the British Grassland Society. Grazing days by young dairy cattle, beef cattle and sheep have been converted to Guernsey cow-days and cow-day values for hay and silage, have been credited to the fields which were conserved.

The outputs of leys and permanent grass fields for the last four years are given in the following table.

Grassland output

		Cow-days per acre	
	Season	*Average*	*Range—lowest to highest field*
Leys	1964	296	123–438
	1965	293	243–468
	1966	343	257–428
	1967	340	240–521
Permanent pasture	1964	215	172–296
	1965	238	186–296
	1966	235	192–278
	1967	200	164–291

Conversion factors of 70 and 20 cow-days per ton of hay and silage respectively have been used; these are lower than those recommended in the Journal of the B.G.S., Vol. 19, No. 1, 1964.

It is evident that the average outputs in 1966 were higher than those of 1964. Moreover, the output range figures show that this improvement was achieved by raising utilized production from the poorer fields and not through further increases in the performances of high-yielding fields. Grazing and conservation records focus attention on fields which make a low contribution to stock requirements. Such fields can be reseeded or, if wet or steep, their management may be improved. For any improvement to be effective it is vital that either additional stock should be carried to use extra production or the total grass area should be reduced when herd or flock numbers are remaining the same. Otherwise, improvement of part of the grass acreage would mean reduced utilization of other fields. The improvement may, of course, result in better quality grass and a reduction in purchased feedingstuffs, but in most cases higher stocking is the key to better performance. At Seale-Hayne in 1966 more stock was kept with about 20 acres less grass than in 1964. But in the 1967 season rather less stock was carried than had been planned early in the year. Whilst production and utilization from leys remained good there was less pressure on the permanent grass and utilized output from the poorer and more distant fields fell below that of earlier years.

Variations in field production

Surveys of grass output always show wide ranges in the performances of individual fields on the same farm. What are the reasons? Some differences are due to soil type and topography but many result from differences in management. It has been found frequently that fields from which much of the year's production has been conserved have given high yields. Avoidance of wastage by treading or soiling, quick defoliation and longer recovery periods are contributory factors in comparison with fields which are mainly grazed.

The amount of nitrogenous fertilizer applied also has a profound effect. Higher outputs have been found to be associated with increased use of nitrogen. This general relationship is evident in the field results of Seale-Hayne, but there are marked exceptions; high yields, of over 400 cow-days per acre, have been achieved with applications of nitrogen varying from 105 to 350 units per acre. The highest application of nitrogen was to a field of S 22 Italian ryegrass which was mainly grazed by the dairy herd. However, similar yields were obtained, using less nitrogen, from long leys containing clover and where the production was conserved or grazed by the dairy herd. It is a feature of the results that almost all the fields which were strip grazed and provided silage for the dairy herd were high yielding. In 1966 they had an average output of 385 cow-days per acre. Ley fields less accessible to dairy cows from which hay or silage was taken and which were periodically grazed by young cattle or sheep had lower outputs averaging 298 cow-days per acre. Also, these fields received rather less nitrogen per acre. Thus differences in performance are due to a number of interrelated factors—the type of stock, method of grazing and nitrogen use, all of which are tied up with convenience and accessibility to the dairy herd.

One exception to the above pattern is a piece of ground which is part ley and part steep permanent grass. The field is split into paddocks and rotationally grazed by a herd of Devon suckler cows. Under this system of management and with a little over 200 units of nitrogen in 1966 an output of 384 cow-days per acre was obtained from relatively poor land. The potential of the system is such that in 1967 a similar rate of stocking and output was obtained from the same field with only 120 units of nitrogen per acre.

Other interesting pieces of information were revealed by the records for 1966. A ley, which in 1965 had been the highest yielding with 468 cow-days per acre, produced only 260 cow-days per acre in 1966 despite high nitrogen use. Explanations for this include very slow recovery and poor growth following grazing in wet weather and subsequent utilization which was limited to periodical grazing by heifers and sheep. By comparison, the monthly records for the higher-yielding year showed that the field had been regularly strip grazed by dairy cows. This ley had been down for six years and following its poor performance in 1966 it has been ploughed and reseeded. Here is an illustration of the value of field records in showing when production has fallen far below the potential of the field.

Seasonality

It can be observed that permanent grass fields produced only fifty per cent of their annual output by the end of June whereas the better leys had supplied sixty per cent of their utilized production by this time. The permanent grass produced little early growth. In some cases this was due to heavy wet land but in others fields were steep and hilly and had carried sheep during the winter. Low summer production from these fields had been obtained in other years, particularly after outwintering beef cattle, and additional housing has now been provided to avoid the winter damage to grassland which is common under the fairly high rainfall of the South West.

In other studies,[1] the kind of seeds mixture and the age of ley have been considered as determinents of the level of production. It is impossible to draw

[1]See, for example, *Grassland Recording*, Farm Business, Vol. VI, No. 3, June, 1967.

conclusions about these from the Seale-Hayne results. Italian ryegrass alone, perennial ryegrass, perennial ryegrass/timothy and meadow fescue/timothy mixtures with white clover have all produced high outputs. There is a tendency to use more nitrogen on pure Italian ryegrass swards but part of the function of this has been to encourage early and late production. Also, just as good yields have been obtained from older leys as from those in their first or second full season. In this connection, it is better to know how an individual field is producing than to take decisions based on botanical composition or on simply the number of years a ley has been down. On all-grass farms, the maintenance of high production at minimum cost, in terms of reseeding and lost production in the reseeding year, is the main objective. Field records can assist a farmer to decide when it is time to renew a ley if he is to maintain or improve the stock-carrying capacity of his farm.

Use in gross margin analysis

There is a further use for the results of grazing and conservation records on mixed livestock farms. The number of cow-days of grazing utilized by each class of stock, i.e., dairy cows, heifers, beef suckler herd, fattening cattle and sheep, during the period when there can be alternative uses, provides the most accurate means of allocating variable costs and grass acres to the various livestock enterprises. Thus the grass records can be used in gross margin or full cost analysis. Also, if there are different classes of land, either in terms of quality or accessibility, the shares of the actual areas can be allocated to the stock concerned. This is usually impossible with breakdowns based on the ratio of livestock units of the different classes of stock jointly using the whole or parts of the grass area. For example, in the 1966 gross margin analysis of the College farm results, Devon beef cattle would have been allocated 38 acres of grass on their proportion of livestock units compared with 31·8 acres allocated from the grazing records. On the other hand, sheep would have been allocated 50 acres instead of the 57·4 acres—made up of 17·5 acres of leys, 35·6 acres of permanent pasture and 4·3 acres of kale—which were attributed following the analysis of the field records. These differences were due not so much to the relative cow-day and livestock unit values as to different management. The Devon cows were intensively grazed whilst the sheep utilized a high proportion of lower yielding permanent grass. The apportionment does affect the gross margins per acre from the different enterprises and the interpretation of these gross margins.

Utilized starch equivalent values

Information on outputs and utilization of grass based on cow-day calculations can be used to assist management on the particular farm in the various ways discussed above. Further evidence can be gathered when output figures are available over a number of years. However, the results may not be so easily compared with those of other farms and for this purpose it is recommended that the utilized starch equivalent value of a cow-day is calculated for each month and the total annual production derived in U.S.E. terms. This is a useful means of bringing together results for different dairy farms when breed, yield and concentrate feeding differ. Expressed in these terms, the 1966 Seale-Hayne results were 30·3 cwt of U.S.E. per acre from leys and 19·5 cwt per acre from permanent grass.

How accurate it is to assume the same monthly values for cow-days of grazing by beef cattle and sheep as that achieved by the dairy cows is uncertain. In May, the value of a cow-day was over 12 lb of U.S.E. for the Guernsey cows at Seale-Hayne and in September and October around 8 lb of U.S.E. More work in recording liveweight gains will be necessary to assess whether similar figures apply to cattle rearing and sheep. Such information could be most useful in the future planning of mixed livestock systems. For the present, it has been demonstrated that records assembled in cow-days can provide the discerning farmer with guidance and evidence to assist in his decision making.

The uses and value of grassland records may be summarized as follows:

1. They provide a means of identifying poor producing fields so that appropriate action can be taken.
2. Records over a number of years show progress overall and, for particular fields, the effects of improvements such as grassland renovation treatments or drainage.
3. They may provide evidence of differences in output due to seeds mixture, nitrogen use, grazing technique, seasonality of production and, in some cases, indicate the effects on subsequent production of outwintering stock.
4. On a farm with mixed stocking, grazing and conservation records provide sound bases for the allocation of grass acres and grassland variable costs to the different classes of cattle and sheep for business analysis and planning purposes.

The author, **G. W. Furness, M.Sc., Dip.F.M.**, was Head of the Farm Management Department at Seale-Hayne Agricultural College until August, 1967. He is now Deputy Chief Agricultural Economist in the Ministry of Agriculture, Northern Ireland.

Rinse out that Container

The smallest amount of toxic chemical left in a used container can be a real danger to children and animals. If it gets into a ditch or stream it can also poison fish and livestock.

Empty metal or plastic containers should be thoroughly washed out and the washings added to the contents of the spray tank. Returnable containers should be washed out and sent back to the suppliers without delay. Cardboard containers and plastic sheet bags should be emptied completely and these and other combustible containers should be burned. Containers which will not burn should be flattened and buried at least 18 inches deep in an isolated area.

Partly-full containers should always be tightly closed and stored in a safe place away from feedingstuffs and out of reach of children and animals.

Are the present farm credit arrangements adequate to reap the benefits from technical development? Alan Harrison of Reading University discusses the problems involved.

Capital in Farming

MOST farm businesses are small, and the large amount of publicity given to a few spectacular large farming empires, important though they are, should not be allowed to obscure that fact. Even allowing for the rapid rise in land prices of the last seven or eight years, probably well over one-half of farmers employ less than £10,000 in their farms. As personal fortunes such sums are, of course, quite large. But they tend to represent the accumulated savings not only of the individuals currently farming, but also of earlier generations of farmers, for farm finance is, in a very real sense, family finance with the burden of foregone consumption widely shared. Individual proprietorships or partnerships between close members of the family are appropriate for such forms of business finance and other business forms are rare. A relatively small part of capital is borrowed and it is uncommon to find that borrowings represent more than 10 per cent of resources. Put the other way round, most farmers' net worth is over 90 per cent of their assets.

A number of factors are involved in the explanation of this state of affairs. In the first place, for some time, though more especially in recent years, land prices have been rising much faster than newcomers have been coming into farming or than farmers generally have been changing from a landlord-tenant to an owner-occupier system of tenure, so that for a large number of farmers rising land prices represent untapped capital gains. For a few, however, they present severe capital accumulation problems. In the second place, farmers' low borrowing is a reflection of the insecurity which proprietorship or partnership trading represents and in which not only business assets but also entire personal fortunes stand to be lost. It is not low borrowing but high borrowing in farming which calls for some special explanation. This is frequently overlooked and it is sometimes argued that farming's overall capital structure is a product of her credit institutions and not the other way round.

Our farm credit institutions display several interesting characteristics, especially when compared with arrangements in other countries. Firstly, there is little State intervention, secondly, co-operation plays an almost insignificant role and, thirdly, commercial banks dominate the scene. In fact, both basic capital structure and basic credit structure are products of the same historical conditions—an early industrial revolution in which agriculture played a key role as a provider of food, capital and man-power; the associated development of finance and especially banking; together with the

designing of a pattern of farms which, though frequently almost an accidental by-product of this country's landowning, aristocratic avenue to political power, nevertheless, has endured and is only now proving seriously incapable of adapting itself rapidly enough, unaided, to changing technology. Moreover, it is not correct to conclude that the British system of farm credit and farm support is necessarily less in amount or in effectiveness than the complex systems of quotas, subsidies and credit manipulation that exist elsewhere. In any case, however, farming's credit structure must be seen in the light of overall government support to the industry and the increasingly important role that direct investment grants for specific items have come to play.

At the same time, it is important to consider the adequacy or otherwise of present farm credit arrangements to service an industry of high and probably still rising land prices, continuing decline of landlordism and increasing pressure to form larger size business units in order to benefit from technological developments. Studies at Reading University have shown how increasingly difficult it has become, in the South East at any rate, for a newcomer without prior possession of considerable private means to begin farming on an adequate scale, and how two relatively new types of farmers are becoming more numerous—the heavily indebted young entrant on the one hand and the older, low-borrowing, part-time industrialist or professionally employed, on the other.

The question of how, if at all, the selection of farmers ought to be interfered with, or, in the event of significantly changing areas of recruitment becoming apparent, general farming policy ought to be changed, is not one to be tackled here. However, it is important to refer to some of the issues that arise with rising land prices and indebtedness in farming. Two related matters call for comment. First, as land prices increase so the traditional solidarity of farming families can be expected to weaken; for the desire to reap capital gains will be increased and the traditional ease of transfer of farms from one generation to another will be thereby lost. Secondly, and partly in consequence, the present array of credit sources may prove unable to effect land and farm transfers in the most appropriate ways.

We have a long history of official pronouncements of approval of our array and operation of bank and other institutional sources of lending to farmers. None was more generous in its praise—and condemnation of farmers for not borrowing more—than the Radcliffe Committee. Nevertheless, not everyone can approve of a situation in which, after half a century of revolution in land tenure, of the £600,000,000 institutional lending to farmers, about £500,000,000 is from the banks who still maintain that their business is not to lend for the long term. Rising land prices and a tendency for farmers to come from farming families, thereby permitting initial capital to be acquired relatively easily on a family finance basis, have combined to provide a comfortable buffer to absorb the risks inherent in large-scale bank finance of farm real-estate transactions. The future may not be so accommodating.

This article has been contributed by **Alan Harrison, M.A. (St. Andrews), M.Sc. (Reading),** who is engaged in research and teaching in the Department of Agricultural Economics at Reading University. His interest in the capital and credit structure of farming in both developed and under-developed countries has involved him recently in detailed studies in South-east England, especially Buckinghamshire, and in Botswana.

12. Tiverton, Devon

R. P. Doney

THE N.A.A.S. district of Tiverton meets the county boundary of Somerset at Exebridge and follows the river Exe to Bickleigh Bridge, one of the 'most photographed' bridges in the west country, about four miles south of Tiverton. Though extending to only about eight miles each side of the river it nevertheless contains a variation in soils, topography and farming systems.

To the west and north it rises quickly into the shales and then on to grey Culm soils at an elevation of 800–900 feet with a rainfall of up to 45 inches resulting in drainage problems. The clay land, some of which has been improved by ditching and draining, was the area where the earliest trials on rush control by spraying were carried out. The farming is predominantly dairying and mixed livestock, including a high proportion of sheep. In fact, the total sheep population for the whole district amounts to one breeding ewe per $1\frac{1}{2}$ acres of total land. The amount of corn grown is influenced partly by the need for barley and oat straw for bedding and the 'reed' from wheat straw for thatching. Many thatch roofs remain, but it is becoming increasingly difficult to find craftsmen to carry out this skilled work. Much of the farming in this part is still traditional with very little specialization.

One of the traditions is the annual Bampton Fair in October when the streets of this small town are lined with stalls and 'cheap-jacks', and the ponies from Exmoor are brought down for auction.

Eastwards the more level land on the fringe of Devonian red soils is much 'kinder' and more arable farming is practised, but milk production still constitutes the highest single output on most farms even in this area. This is partly due to the size of the holdings.

The largest farm in the district is just over 350 acres, but there are very few of this size; in fact, half the total number of holdings fall into the range 50–150 acres. From this it will be seen that there is a need for some form of intensive enterprise on the majority of holdings.

The cereal crops are mainly barley with some wheat grown as a first crop after ley. New varieties are tried but Proctor barley and Capelle wheat are still widely grown. There now seems to be a slight renewal of interest in oats. A few swedes are also grown both for stockfeed and for sale for human consumption.

Formerly the Devon or 'Red Ruby' was the main breed of cattle but the introduction of the milk lorry to outlying areas has led to a predominance of Black and White.

A localized breed of sheep is the Bampton Ewe—derived from selective crossing between the Devon Longwool and Closewool, mostly resembling the former, which seems to suit local conditions. Many other breeds have been tried and the Half-bred is increasing, being crossed with Down rams for fat lamb production.

Being an area of fairly small farms a considerable number of pigs and poultry are also kept.

Country life

The district is truly rural and the inhabitants have a strong interest in country sports having staghounds, foxhounds and beagles. The river Exe is noted for its salmon and trout fishing but it does also cause considerable inconvenience with its flooding. On occasions, floods have washed away crops and sheds from adjoining fields and risen to gate level in some farmyards and 'bar-height' in at least one inn. On both sides of the river, the land rises quickly with steep slopes that are covered with a mixture of conifers and deciduous trees presenting a magnificent spectacle of coloured tints in the autumn; a sight much admired by many visitors.

Tiverton itself, is a market and industrial town with a population of some 13,000. It was the site chosen by the weavers who came south during the Luddite rebellion and started the lace industry which has now given way to the manufacture of synthetic fibres, in particular non-inflammable nylon. Another product of very high prestige is specialized wood-working machinery including band-saws which have a world-wide export trade. Thirst is catered for by a brewery.

Due to some difference in water all the paper mills are situated on the river Culm, a tributary of the Exe, but this is near enough to influence the working population of the district and, together with other industries, competes with farming for labour. Many of the farms are now owner-occupied and many others come under two local estates, but together both the town and country seem to combine to form an area of stability.

Foamed Polyurethane Insulation

P. D. Friend, *Agricultural Land Service, Cambridge*

LARGE quantities of insulating materials are being applied to the roofs and walls of farm buildings, both old and new. Sometimes the materials that insulate are also structural, as lightweight concrete blocks, but in a great many cases the insulating materials are applied inside the walling and below the roofing as additions to an otherwise complete construction.

With the introduction of industrialized building systems, particularly for intensive farm enterprises, many such buildings consist of prefabricated units which are lined internally and contain adequate insulation with vapour seals. To improve insulation in an existing building can, however, be far more difficult, particularly when it is necessary to provide a complete supporting structure to carry the insulation, vapour seal and the internal lining. Much time and money can be spent in fixing the supporting framework while constructional difficulties may prevent the insulation being as effective as it might be.

In almost all farm buildings insulation that is to have any reasonable life must be protected by a vapour seal because of the high humidity which is encountered, especially in buildings for livestock. There is no great difficulty in making internal linings vapour proof, but there can be difficulties in making the barrier continuous at the joints. When, as so often happens, these difficulties are not fully surmounted, a partial or complete failure of the insulating installation occurs.

In recent years a new insulating material known as foamed polyurethane has become available. This material can be applied by spray, as a mixture of liquids which, after striking a surface, foams up and solidifies. Any thickness can be applied but $\frac{1}{2}$–$\frac{3}{4}$ in. is usual for most farming applications. The surface is slightly knobbly, cream to buff in colour and shiny. Not unnaturally, a characteristic is that irregularities in the base surface are reproduced on the surface of the insulation. For example, joints in brickwork show through on the surface of the insulation which makes the insulation look no thicker than a coat of paint and only probing with a nail or knife-blade, either of which penetrate the material easily, will show the true thickness. The material can be applied to surfaces of any shape and the insulating layer continues without break along surfaces, around purlins, over bolt-heads,

water pipes and joints in or between materials. It will adhere to any hard, dry, clean surface. Naturally, surfaces in existing buildings have to be thoroughly brushed before spraying starts and most operators have heaters to ensure that all surfaces are dry before work commences.

The glazed appearance of the surface of the material is a sign that it has some continuous skin which acts to a moderate extent as a vapour barrier. As in this respect all agricultural buildings need to be highly efficient, an additional barrier is usually sprayed on. This may either be a buff-coloured plastic, or a suitable alternative opaque decorative finish. Where people must work at such tasks as grading fruit and vegetables, the lighter the colour the better.

The material is not mechanically strong; a knife will penetrate it easily. When compressed it has some ability to regain its original form but not completely. Two potato stores in East Anglia illustrate different approaches to the problem of living with a tender material. Both had foamed polyurethane insulation on the walls down to floor level. In the first store, complete protection was provided to ensure that neither potatoes nor machines could damage the insulation. This was costly but effective. In the second store no attempt was made to protect the insulation. After two seasons in which the potatoes were stacked ten feet high against the insulation, there were only a few small shallow impressions in the surface caused by pressure of potatoes and only one small damage by machinery, although all the potatoes had been loaded into and out of the store mechanically. However, in buildings such as those in which livestock are housed or which are subject to rough treatment it would be more practicable for this kind of insulation, if used, to be out of the danger zone.

The cost of this material depends on the usual factors that affect all building costs and also on the nature of the surfaces to be coated. For example, corrugated asbestos-cement sheeting will use a third more material than flat sheeting. In high buildings, scaffolding will increase costs. As a very rough guide, a number of jobs in the last two years have worked out at about 2*s.* 10*d.* per square foot based on the plane area of the walls and roofs covered.

Polyurethane insulation, unless it is of a kind which contains fire retardant chemicals, can present a serious fire risk. Alternatively, a protective coating of gypsum plaster, sprayed asbestos or a suitable fire-retardant paint may help to reduce the flammability of the polyurethane lining. The degree of protection needed must be carefully considered by those designing buildings for storage of flammable material or valuable livestock.

The Farm Buildings Pocket Book published by the Ministry contains some useful advice giving standards, dimensions and data for those interested in the design of farm buildings. Copies may be obtained from Government Bookshops (addresses on p. 308) and booksellers price 3s. 6*d.* (by post 3s. 11*d.*)

in brief

- **Oilseed rape**
- **New vermin spring trap**
- **Dry stone walling**

Oilseed rape

At a time when many large-scale cereal farmers are tentatively exploring the advantages of including an effective break crop in their cropping programmes, a booklet* on the technical and economic facts of oilseed rape comes opportunely. It has been published by Wessex Agricultural Producers Ltd. and the Agricultural Division of Imperial Chemical Industries Ltd. following their joint investigation in 1967 of the best methods of growing both winter and spring rape on sixty-six predominantly cereal farms. Crop husbandry records and data on the yield of seed and oil were obtained from each of eighty-eight fields, pointing to the essentials of rape seed production.

The crop is shown to be one particularly attractive to chalk downland farmers and, because of its susceptibility to damage by pigeons, is more suitably grown on the larger farm in blocks of around 20 acres or more.

Although winter rape is potentially higher yielding in seed and oil, the necessity of sowing during the early autumn scramble of stubble cleaning and other work, and perhaps clashing in a late season with harvesting the last of the grain, will in many instances prove too restrictive. Spring rape will therefore often be more attractive.

The survey has shown distinct yield advantages from sowing (essentially on a fine, firm seedbed) in March or the first week in April, either broadcast or drilled, at about 6 lb seed to the acre. The Swedish variety Nilla has now ousted Zollerngold from its place as the most popular, and the report names a new variety, Rigo, as being of interest because of its shorter, thicker stems and thus greater resistance to lodging.

Thorough cleaning of the stubbles after grain harvest will diminish subsequent grass and broad-leaved weed seedlings and dispose of 'volunteer' cereals which could carry over cereal diseases, and once the rape crop is well established it will smother late-germinating weeds.

A generous fertilizer programme is as essential for oilseed rape as it is for any other brassica; nitrogen in particular. The overall average treatments in this investigation were (units/ac) N 70, P_2O_5 47 and K_2O 55 as a basal application, and 62 units N as a subsequent top-dressing. The correlation between fertilizer rates and yield of seed and oil are set out in fair detail in the booklet. In an additional series of replicated trials with spring rape by I.C.I. a total of 100 units N per acre (basal and top-dressing) was used. The average crop here yielded 13 cwt seed, and each additional 25 units N applied gave an extra 1 cwt seed, to reach a yield of about 17 cwt seed with 200 units N per acre. (The results of similar trials carried out by the N.A.A.S. over a much longer period, indicates that optimum nitrogen level is around 150 units per acre, the higher rates tending to lower the oil content of spring rape, without an increase in seed yield).

The economics of growing oilseed rape *as a cash crop* can only be described as fragile in the present circumstances of world production of over $3\frac{1}{2}$ million tons,

*Free from I.C.I. Ltd. P.O. Box No. 1, Billingham, Teesside.

but, says the report, 'for most growers in this survey the prime reason for introducing the oilseed rape crop had been undoubtedly the need for an effective break crop. Grass weeds were a problem on many of these predominantly cereal growing farms. In these circumstances the growers were seeking a crop that would allow some cleaning operations, and the yield of oilseeds was a secondary consideration'.

The real value of this break crop must be viewed in the light of its impact on the gross margin of a farm as a whole.

New vermin spring trap

Another spring trap for the control of vermin, the Lloyd trap, has been given Government approval, bringing the total of such kind of traps to nine. They may be used only for the purpose of killing or taking grey squirrels and stoats, weasels, rats, mice or other small ground vermin, and set in natural tunnels or in artificial tunnels constructed for the purpose; or for the killing or taking of rats or mice and set in the open on their runs.

The Lloyd trap, which also has the approval of the Humane Traps Panel, is manufactured under the authority of the National Research Development Corporation by W. and G. Sidebotham Ltd., Graisley Works, Rookery Street, Wednesfield, Staffs.

Dry stone walling

Lunky hole, clonk and throughband are just three terms that are hoary with age and hallowed by tradition in the dialect of the dry stone wallers of Galloway and Dumfriesshire. Wherever stone has been found ready to hand throughout this and other parts of Britain, from the Orkneys to Cornwall, this most ancient of all rural crafts has flourished by the skill passed on from one generation to another. Today, however, the numbers of these craftsmen have dwindled. Interest in this, the earliest known form of enclosure, needs to be stimulated.

The Stewartry Drystone Dyking Committee, which was started by the late Col. Rainsford-Hannay, C.M.G. of Kirkdale in 1938, is a nucleus of activity in this cause, and is now seeking support for the formation of a nation-wide Dry Stone, Dyking and Walling Association. Membership, at a fee of 5*s*, will be open to everyone interested in the craft, and Mrs. Murray Usher, the Convener (address: Cally Estate Office, Gatehouse-of-Fleet, Scotland) will be pleased to hear from all who wish to support the present endeavour. In this way we are likely not only to preserve a heritage, but also a skill in building from local material long-lasting, stock-proof enclosures without mortar or cement. They give shade in summer and protection in winter, they require little maintenance and, unlike some present-day alternatives, they are 'a gentle salutation to the eye'.

Demonstrations of dry stone walling will be given at the Royal Show at Stoneleigh and the Great Yorkshire Show, Harrogate, next month.

Glossary

Lunky Hole: A small rectangular opening sometimes made at the bottom of the dyke to let water through and as a passage for sheep and hares.
Clonk: Large stone in the single dyke and below the cope.
Throughband: Long flattish stones which, by their weight and roughness, help to 'tie' the stones.

Books

Forest Planning. D. R. JOHNSTON, A. J. GRAYSON and R. T. BRADLEY. Faber and Faber, 1967. Six guineas.

Trees take many years to mature, and the prudent forester must extend his plans over many seasons. Trees also cost money to plant, and the cash return from their timber is long delayed. But if well chosen and well managed they do in fact grow, both in volume and in value, more certainly than any other form of long-term investment. The steady expansion of tree planting over the past fifty years bears witness to the fact that landowners continue to find the establishment of plantations worth while. More trees are being planted today, on private estates as well as in the national forests, than at any other time in Britain's history.

The experience of fifty years' planning and achievement, in both state-owned and private woodlands, has been distilled into a remarkably well-ordered and readable account by three Forestry Commission management experts. David Johnston is the planner in this team, Arnold Grayson the economist, and Roger Bradley the authority on the measurement of timber crops and their rate of growth. Together they have marshalled all the lines of thought that a forest manager should follow before deciding on any course of action. What trees should he plant, how far apart, and with what markets in view? When should he thin them out, or fell the final crop to gain highest profit? Will he need more roads on his estate to harvest the timber, and if so, what mileage and at what cost? Obviously the answers are going to differ for every locality, but the ways of arriving at them will be much the same everywhere. We are given here, for the first time in British forestry, a series of recommended approaches to each problem, supported by diagrams to show the mathematical principles involved, and tables of representative figures to show how the data should be organized.

This is essentially a book for the professional forester, at home or abroad, rather than the farmer or landowner. It is sure to become a classic for the student. Its only fault is one common to most books on planning of every kind: not enough allowance is made for things going wrong, for the everyday mishaps that cause the best-laid schemes of mice, men and even foresters, to '*gang agley*' more often than not.

At times the reader feels that these plans are intended for a 'text-book' forest, rather than for a real one made up of living trees that blow down, catch fire, or perish from unforeseen diseases at just the wrong time to yield the best profit!

Recreational values receive well-merited attention. Woods can do much to relieve the pressure of visitors on farm land. 'This', say the authors, 'is partly because the forest land can, in Britain, be owned by the State and therefore be made freely open to the public, and also because forests are better able to stand up to recreation. Trees can neither be trampled upon nor frightened, nor can they stray through open gates!'

H.L.E.

Principles of Field Crop Production (2nd Edition). J. H. MARTIN and W. H. LEONARD. Collier-Macmillan, 1967. £5

This must be rated as one of the most comprehensive and best-produced text-books on crop production ever printed. It is designed as a standard text for students of agriculture in the United States and, naturally, is specifically orientated to the conditions of that country. There are, however, two considerations which give it a world-wide currency. First, the sections on general principles of crop husbandry have universal application and, second, the United States has such a wide range of environments that a very large number of temperate and sub-tropical crops are found within its borders and are, consequently, dealt with here.

The book is large; it contains over 1,000 pages and is divided into four main parts. General Principles of Crop Production; Crops of the Grass Family; Legumes and Crops of other Plant Families. Each part is divided into chapters dealing, in Part I, with an aspect of the general principles, for example, tillage practices, or, in the remaining parts, with a specific crop. A few chapters are sub-divided to cover a number of the minor crops. The text is lavishly illustrated with maps, diagrams, line drawings and photographic plates. The

maps show such facts as the world distribution of a crop and the distribution of it within the United States of America, climatic zones, harvesting and planting dates in different States where appropriate. Diagrams are mostly of the segment of a circle type displaying such information as the major uses of land. The line drawings, which are very well produced, are mainly botanical and are supported by photographs of high quality. Other photographs show aspects of crop culture and of machinery and a few are mainly of historical interest. A list of references at the end of each chapter forms a useful guide to further reading but includes a rather high proportion of pre-second world war work. The book concludes with a fifth part or appendix consisting of tables of facts on the crops dealt with, such as seed rate, bushel weight, chromosome number, etc. The Glossary of Terms Used and the Index are on a scale to match the book.

A surprising omission is the absence of any discussion of the principles underlying irrigation. The lack of this is felt throughout the book where irrigation is referred to under crop headings. Presumably the authors feel that the student should acquire this background from specialized texts but, in a book which covers so many apects of the subject, this omission stands out. It also seems a pity that the main crop parts of the volume should end with a 'rag-bag' of crops which are either not now grown or are of very little importance. The edition, for this reason, seems to peter out though, perhaps, it is difficult to avoid this arrangement.

As a whole, however, the book deserves to be considered as a classic example of its type, and well worth a place on anyone's shelf.

R.S.E.

Pigeons and Doves of the World. DEREK GOODWIN. British Museum (Nat. Hist.), 1967. Six guineas.

The student of ecology or ethology loses much unless he can relate his personal knowledge of a few chosen species to the wider background of speciation of animal groups as a whole. The systematic approach is equally limiting if made without reference to the living animal in its environment. The museum authorities, therefore, are to be congratulated in commissioning one of their experts to help remedy such failings so far as the Columbidae are concerned. The result is an excellently produced and authoritative work, providing a framework within which the ecology and the resultant economic place of problem species, such as the wood-pigeon *Columba palumbus* and the feral form of the rock dove *C. livia*, can be assessed.

Short, introductory sections cover such topics as nomenclature, plumage, breeding, feeding and drinking habits, voice, display, social and anti-predator behaviour, the whole set against a background of adaptive radiation and speciation. The value of comparative studies for establishing the evolutionary history of the group is clear, not least in the treatment of comparative ethology, a field which has been a life-long passion of the author. Inevitably, extensive detailed information has had to be omitted in this condensed general survey covering such a wide range of subjects and it is a pity that space could not be found to deal with internal anatomy and general physiology. Regrettably, insufficient is known about the breeding seasons, feeding habits and so on of most species to make a comparative approach profitable. Fortunately, various behaviours of many exotic species have been observed in captivity, in a large number of cases by the author, and it is fitting that these aspects receive more extensive treatment; they are the key to understanding the evolution of many colour patterns and display structures. For instance, the bowing display is common to most pigeons and usually culminates with the head bent down. In contrast, in the Luzon bleeding-heart *Gallicolumba luzonica* from the Philippine Islands, the movement reaches its climax with the head thrown back and the breast puffed out and this accounts for a brilliant red patch in the middle of the breast of an otherwise fairly nondescript bird.

The bulk of the book is devoted to a systematic account of all the species of Columbidae, including those recently extinct. For each species there is a description, accompanied by a black-and-white sketch, and notes on distribution (with map) and habitat, feeding and general habits, nesting, voice, display and synonyms. It is a great pity that finances prevented the pictures from being done in colour, even so they have been beautifully executed by Robert Gillmor from original sketches by the author (himself no mean illustrator). To give some idea of the colours and sexual dimorphism of the group there are three excellent colour plates, again by Gillmor. The text of the systematic section is as comprehensive as it could reasonably be, but alas, for so many

of the species virtually nothing is known about their natural life.

The book is a compendium of so much special knowledge, compiled from widely scattered literature by a student uniquely informed, that it is a pity that the bibliography was not made more extensive. In fact, this is the only substantial criticism of the book. For instance, the comparatively well-known band-tailed pigeon *Columba fasciata* of N. America is given three references, the mourning dove *Zenaida macroura*, a favoured sporting bird of the U.S.A., of which an overwhelming economic literature exists, gets five references, none more recent than 1932. These omissions are not to be excused on the grounds that the book is a museum piece, relating only the priorities of taxonomic nomenclature. This is far from true because the book, in spite of these drawbacks, really brings the pigeons of the world to life in an exciting and stimulating manner. It must prove an invaluable and stimulating source book for the serious worker and will long stand as an example of how the systematic treatment of animals should, and can, be related to the living creature in an attractive manner. I shall treasure my own copy.

R.K.M.

Agricultural Producers and their Markets. Edited by T. K. WARLEY. Basil Blackwell, 1967. 84*s*.

This book is a collection of fifty-five papers read at an international seminar on agricultural marketing, special attention being given to the role of co-operatives in the marketing process. The seminar was sponsored by the Ministry of Overseas Development and held at the University of Nottingham. The papers were given by academic and applied marketing specialists and senior executives from food trading and processing industries. Although general emphasis is given to the marketing problems of developing countries, extensive consideration is also given to agricultural marketing in developed countries.

The papers are organized in four sections. The first, 'Marketing in Context', places the need for efficiency in marketing systems and the contribution of producers' co-operatives against the background of an examination of the process of economic development, the key role of rising agricultural productivity in this process, the problems of world trade in tropical and temperate agricultural products and development in sea transportation affecting primary product exporters. There is little new in these contributions but they summarize very competently their respective themes; indeed they are to be commended to all students of agrarian development.

The contributions to Part II, 'Commodity Policies and Markets', comprise two papers on each of nine commodities of major importance in international trade—coffee, cocoa, tea, cotton, sugar, oilseeds and fats, grains, bananas and tobacco. One paper on each commodity reviews factors affecting production, consumption, prices and trade. The second describes international and national marketing systems for the product and presents the views of traders and processors on the performance of the existing marketing system. This section is packed with interesting information which gives the reader a clearer insight into the markets for these products.

Co-operative marketing is dealt with in greater depth in the second half of the book. In Part III, 'Producers' Marketing Organisations', there are papers which examine the characteristics, status and problems of various types of producers' organizations in Britain, Europe and the developing countries, including marketing boards, traditional co-operatives, co-operative groups and producer-sponsored marketing companies. And in Part IV, 'Organisation and Management', the contributions survey such topics as the influence of co-operative law, the conduct of feasibility studies on the promotion and development of co-operatives in developed and developing countries, the principles of business organization, investment appraisal, managerial accounting, data processing, labour management, and public relations and their application to farmers' marketing organizations. The concluding papers examine some long-term issues facing farmers' marketing organizations, including the spread of contractual marketing arrangements, the need for advertising, market research, education and training and the role of co-operative apex organizations. From this list it will be seen that few aspects of agricultural marketing are omitted.

This book is undoubtedly one of the most useful contributions to the growing volume of literature in agricultural marketing. There are one or two points of criticism which might be made. Some of the contributions, though valuable in themselves, appear to be irrelevant to the theme of agricultural marketing and might well have been omitted, if only to reduce the size

and price of the volume. One serious deficiency of such a tome is the absence of an index. But considering the diversity of topics covered, one can appreciate the editor's reluctance to provide an index. There is, however, a detailed table of contents which goes some way to make up the deficiency. These are but small blemishes which do not prevent me from warmly recommending the book to all those professionally concerned with agricultural marketing.

E.S.C.

The Autobiography of William Cobbett. Edited by WILLIAM REITZEL. Faber and Faber, 1967. 9*s.* 6*d.* (Paperback).

The image of William Cobbett as a man of unquestionable sincerity of purpose, a humanitarian governed by indomitable determination and a profound belief in his own infallibility erupts, rather than emerges, from the pages of his autobiography. Born into an age which saw the swift passing of the old economic order in England, the long struggle with Napoleon, mounting taxation, higher rents and an impoverished rural population, Cobbett never ceased his self-appointed crusade against what he judged to be the misconceptions and mismanagement of the Government. He was a man of the hour.

His *Political Register*, the weekly newspaper which he started in 1802 and continued to issue, even during his two years' imprisonment in Newgate, until his death in 1835, gained a wide circulation and secured a strong hold on working class opinion. *Rural Rides*, which has preserved so much of the picture of the politico-agrarian conditions in various parts of the country in the early nineteenth century, first appeared in this publication.

Whilst there was much that was a legitimate target for his pen, indiscriminate prejudice lessened the impact Cobbett might otherwise have made in influential circles, and his refusal to accept the inevitability of change marred his judgment. Thus he inveighed against Tory administration and the 'enfeebling' habit of tea-drinking; against Pitt and the potato ('this villainous root'); against corruption in the army and the use of tallow candles. In America he was violently anti-American. He vilified Franklin and Tom Paine, and published a series of pro-British pamphlets under the pen-name of Peter Porcupine. He rejoiced in being a subject of King George. Yet later, back in England a *volte face* and a new set of antipathies brought him into constant conflict with the Government which reduced him and his family to the status of debtors and to the borderline of poverty.

Cobbett's publication of *Parliamentary Debates*, afterwards taken over by *Hansard*, was of special significance among the spate of his literary enterprises, deriving, as he says, from 'an anxious desire that the events, amidst which I lived and in which I had taken so deep an interest, might be handed down to posterity undisfigured by falsehood'.

From plough to Parliament—to which Cobbett was elected as member for Oldham in 1832—is no mean achievement for a self-educated man. Throughout his life he identified himself with the fortunes of the farm labourers caught between the upper and lower millstones of a newly-rich land-owning class and a government that failed to cushion and alleviate the hardships that were otherwise inseparable from the repercussions of a social and economic revolution. In so doing, despite all his dogmatism, William Cobbett has placed himself among the immortals.

S.R.O'H.

books received

Drayton Experimental Husbandry Farm, Annual Report 1967. Ministry of Agriculture, Fisheries and Food. Copies free from the Director, Drayton E.H.F., Alcester Road, Stratford upon Avon, Warwickshire.

Profitability of Farming in the North of England, 1966-67. Results for Selected Groups of Farms. Report 169F.M. S. Robson, Department of Economics, University of Newcastle upon Tyne, 1968. 3*s.* 6*d.*

Economic Aspects of Co-operative Grain Drying, Storage and Marketing. Report 168G. B. H. Davey and G. Ross. Department of Agricultural Economics, University of Newcastle upon Tyne, 1968. 10*s.*

Shooting Woodpigeons. Alex Jardine. Copies free from the Eley Game Advisory Station, Fordingbridge, Hampshire.

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The following firms have joined the Agricultural Chemicals Approval Scheme since the publication of the 1968 list.

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Broadway House, The Broadway,
Wimbledon, London, S.W.19
Telephone: Liberty 6600

Huberts Ltd.,
Doyle Road, St. Peter Port,
Guernsey, Channel Islands
Telephone: Guernsey 23733 S.T.D. 0481

Chas. Page and Co. Ltd.,
52 Grosvenor Gardens,
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Most appointments are limited to nationals of the United Kingdom or the Republic of Ireland who are normally resident in those countries.

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(British Tropical Agricultural Mission)

Animal Husbandry Expert

RC 213/22/05

Duties: To advise and work in collaboration with Bolivian technicians on all aspects of the improvement of ranch management.

Qualifications: A degree in agriculture, preferably with a post-graduate qualification or specialisation in the animal husbandry field, and experience in cattle ranch management. **Salary:** £2,500—£3,100 a year depending on qualifications and experience, subject to British Income Tax, plus a variable non-taxable overseas allowance currently payable at rates from £540—£1,310 a year depending on marital status. Contract 2 tours of 18 months.

BOTSWANA

Irrigation Agronomist

RC 213/19/015

Duties: To conduct experiments under irrigation with a wide variety of crops.

Qualifications and Terms: A degree in agriculture with experience in tropical or sub-tropical irrigation agronomy.

Basic salary scale Rands 2,256—4,440 (£ Sterling 1,316—2,590) a year plus an inducement allowance in the range of £ Sterling 156—336 a year. Tax free gratuity 25% of basic salary and inducement allowance. Contract 2–3 years.

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RC 213/28/02

Duties: To draw up and advise on a programme for improving major crops.

Qualifications and Terms: A degree in agriculture with tropical experience.

Salary: £1,992—£3,526 a year. Tax free gratuity of 12½%. No local income tax. Contract 3 years.

ECUADOR

Wool Expert

RC 213/55/01

Duties: To advise and instruct sheep farmers on management of flocks, shearing and presentation of fleeces in order to improve wool quality.

Qualifications and Terms: Very wide experience of all aspects of sheep husbandry including wool classification and, preferably, a degree in agriculture.

Salary: £2,500—£3,000 a year, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £575—£1,115 a year depending on marital status. Contract 1 year.

ETHIOPIA

RC 213/58/08

Lecturer in Agronomy required to teach at Jimma Agricultural School.

Qualifications and Terms: An appropriate university degree with practical and teaching experience in their subject.

Salary: £1,500—£2,700 a year, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £750—£1,580 a year depending on marital status. Contract 3 years.

MALAWI

Agricultural Research Officer (Rice Agronomist)

RC 213/134/016

Duties: To draw up and execute a programme investigating all aspects of rice agronomy under rain fed and irrigated conditions.

Qualifications and Terms: A degree in agriculture and experience in rice agronomy under tropical conditions.

Salary: £1,485—£2,600 a year. In addition a supplement of £100 a year is payable direct to the officer's bank account outside Malawi and Rhodesia. Terminal gratuity of 15%—25% free of Malawi income tax. Contract 2–3 years.

Senior Agricultural Officer (Irrigation)

RC 213/134/015

Duties: To work as part of an irrigation team.

Qualifications and Terms: A degree in agriculture with relevant experience preferably under tropical conditions.

Salary £2,655 a year. Terminal gratuity of 15%—25% free of Malawi income tax. A supplement of £100 is also payable direct to an Officer's bank account outside Malawi and Rhodesia. Contract 2–3 years.

THE GAMBIA

Agronomist

RC 213/68/02

Duties: To design, carry out, supervise and analyse all agronomic experimentation on various crops; to make recommendations for the extension service and to investigate suitable crop rotations.

Qualifications and Terms: A degree in agriculture, with post-graduate training or experience in field experimentation. Experience of tropical crops is essential.

Salary in the range of £1,314—£1,524 a year subject to tax, plus an inducement allowance of £900 a year, normally tax free, which is paid direct to the officer's bank account outside The Gambia. Contract—2 tours of 15–18 months.

OFFICIAL APPOINTMENTS

IRAN

Lecturer in Field Machinery

RC 213/86/03

Duties: To teach the application, field use, care and maintenance of field machinery, including practical instruction in the field, at the Karaj Agricultural Training Centre, with responsibility for the management of the school farm and the seasonal overhaul of field machinery.

Qualifications and Terms: A good academic background with a degree in agricultural engineering and some agricultural training and teaching experience. The candidate will be expected to assist in popularising mechanical farming on a national level.

Salary £1,900—£2,500 a year depending on qualifications and experience, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £420—£1,115 a year depending on marital status. One year contract in the first instance, with possibility of renewal.

LESOTHO

Teacher in crops production

RC 213/18/01

Duties: To instruct in crop production and control the crops, horticulture and irrigation section at the Agricultural Training School in Maseru.

Qualifications and Terms: A degree in agriculture with suitable experience.

Basic salary scale Rs. 3,324—Rs. 3,684 (£ Sterling 1,939—2,149) a year. An inducement allowance at present in the range of £237—£273 a year is also payable. Tax-free terminal gratuity of 25%. Contract 2 years.

KENYA

Grain Storage Specialist

RC 213/95/011

Duties: To study local storage problems particularly at farmer level and to carry out demonstrations of improved methods of minimising deterioration, particularly when due to insect pests. Responsibilities include planning and executing the training and extension work involved.

Qualifications and Terms: A good Honours degree in Entomology, Botany, or Agriculture and several years' experience of stored products problems in tropical countries.

Salary in the range of £1,750—£2,500 a year depending on qualifications and experience, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £500—£1,080 a year depending on marital status. Contract 2 years.

ZAMBIA

Aflatoxin Expert

RC 213/132/017

Duties: To survey the inspection procedure for the detection of discoloured and inferior quality produce, particularly groundnuts, and the organisation of training courses for field inspection staff.

Qualifications and Terms: Candidates should be 30–60 years old, with *either* wide overseas experience in the operation of produce inspectorates, *or* a degree in a Biological Science with experience of produce inspection and preferably of the operation of training schemes under agricultural extension programmes.

Salary £2,000—£3,000 a year depending on qualifications and experience, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £555—£1,240 a year, depending on marital status. Contract 18 months.

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